

Based on the elevated OVA readings obtained in the field, it was decided to drill one of the cistern soil borings to groundwater and collect soil samples. Table 38 shows the analyses of samples collected below 13.5 ft. in soil boring SBC-3. VOCs (51.32 mg/kg) were detected in the samples collected to a depth of 27.0 to 27.5 ft. Groundwater was encountered at 26 ft.

Perched water was encountered at depths of 13 ft. and 12 ft. while drilling SBC-3 and SBC-6.

The results of total metal analyses and EP toxicity analyses conducted on soil samples collected from SBC-1, SBC-2, SBC-3 and SBC-4 are shown in Tables 39-44. In accord with OEPA September 17, 1985 policy guidance, "Clean Levels for Closures", the soil samples were evaluated with the Student's t-test to determine whether metals contamination was found around the cistern. At the 0.01 level of significance, none of the soil samples collected around the cistern could confidently be said to contain metal concentrations significantly greater than background. No soil samples exhibited EP toxicity.

Six soil borings (SB-34, SB-35, SB-36, SB-36A, SB-37 and SB-38) were drilled in and around the HCC process building to define the extent of perched water believed to be migrating to the cistern and associated piping. The soil borings are shown on Drawing No. 1. Perched water was encountered in SB-36, SB-36A, SB-37 and SB-38 between 2.0 to 3.0 ft. Samples of the perched water were collected and submitted for VOC analysis and the results are shown in Table 45. Perched water did not accumulate in boring SB-38 and it could not be sampled. Perched water was not encountered during the drilling of soil borings SB-34 and SB-35. Table 45 shows that VOCs similar to those found in the cistern were detected in the perched water. VOC concentrations were lower in the sample collected in SB-37, the boring furthest from the cistern. No mineral spirits were identified in the perched water samples.



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TABLE 38

CISTERN BORINGS  
ADDITIONAL SAMPLING DEPTHS  
ORGANIC ANALYSIS

Sample Location	SBC-3	SBC-3	SBC-3
Sample Number	SS-138	SS-142	SS-143
Sample Depth	5.0-6.5	21.5-22.0	27.0-27.5
Parameter (mg/kg)			
Methylene Chloride	19 (J)	6.1	2.7
Acetone	100	38	16.
2-Butanone (MEK)	46 (J)	22	22
4-Methyl-2-Pentanone (MIBK)	LD	LD	4.2
Toluene	120	3.4	2.3
Ethyl Benzene	43	1.0 (J)	0.82 (J)
Xylene	200	5.4	3.3
Total VOCs	528	75.9	51.32
OVA Reading (ppm)	GT 1000	100	GT 1000

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.



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TABLE 39

CISTERN SOIL SAMPLING  
METALS ANALYSES

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4
Sample Number	SS-128	SS-133	SS-137	SS-144
Sample Depth (ft)	0.5-2.0	0.5-2.0	0.5-2.0	0.5-2.0
Parameter (mg/kg)				
Arsenic	13	16	16	15
Barium	LD	LD	LD	LD
Cadmium	LD	LD	LD	LD
Chromium	LD	LD	LD	LD
Lead	5.3	7.8	10	15 (S)
Mercury	LD	LD	LD	LD
Selenium	LD	LD	LD	LD
Silver	LD	LD	LD	LD

NOTES:

- LD indicates less than the detection limit. Detection limits are sample specific. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
- (S) indicates concentration determined by the method of standard addition.



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TABLE 40

CISTERN SOIL SAMPLING  
METALS ANALYSES

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4
Sample Number	SSM-131	SSM-135	SSM-139	SSM-146
Sample Depth (ft)	8.0-9.5	8.0-9.5	8.0-9.5	8.0-9.5
Parameter (mg/kg)				
Arsenic	17	22	23	21
Barium	96	LD	76	LD
Cadmium	LD	LD	LD	4.1
Chromium	23	12	LD	18
Lead	70	12	21 (S)	15 (S)
Mercury	LD	LD	LD	LD
Selenium	LD	LD	LD	LD
Silver	LD	LD	LD	LD

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific. Refer to Appendix C for the specific sample detection limit.
2. (S) indicates concentration determined by the method of standard addition.



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TABLE 41

CISTERN SOIL SAMPLING  
METALS ANALYSES

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4
Sample Number	SSM-132	SSM-136	SSM-140	SSM-147
Sample Depth (ft)	13.0-14.5	13.0-14.5	13.0-14.5	13.0-14.5
Parameter (mg/kg)				
Arsenic	18	29	19	17
Barium	LD	LD	LD	LD
Cadmium	LD	4.1	5.3	LD
Chromium	16	15	11	12
Lead	9.9 (S)	19 (S)	9 (S)	LD
Mercury	LD	LD	LD	LD
Selenium (R)	LD	LD	LD	LD
Silver	LD	LD	LD	LD

NOTES:

1. LD indicates less than the detection limit. Refer to Appendix C for the specific sample detection limit.
2. (S) indicates concentration determined by the method of standard addition.



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TABLE 42

CISTERN SOIL SAMPLING  
EP TOXICITY ANALYSES

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4
Sample Number	SSM-128	SSM-133	SSM-137	SSM-144
Sample Depth (ft)	0.5-2.0	0.5-2.0	0.5-2.0	0.5-2.0
Parameter (mg/l)				
Arsenic	LD	LD	LD	LD
Barium	0.24	0.15	0.16	0.23
Cadmium	LD	LD	0.017	LD
Chromium (T)	LD	LD	LD	LD
Lead	LD	LD	LD	LD
Mercury	LD	LD	LD	LD
Selenium (R)	LD	LD	LD	LD
Silver	0.01	0.01	0.01	0.01

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (R) indicates spike sample recovery was not within control limits.



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TABLE 43

CISTERN SOIL SAMPLING  
EP TOXICITY ANALYSES

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4
Sample Number	SSM-131	SSM-135	SSM-139	SSM-146
Sample Depth (ft)	8.0-9.5	8.0-9.5	8.0-9.5	8.0-9.5
Parameter (mg/l)				
Arsenic	LD	LD	LD	LD
Barium	0.6	LD	0.26	LD
Cadmium	0.011	LD	LD	LD
Chromium (T)	LD	LD	LD	LD
Lead	0.043	LD	LD	LD
Mercury	0.002	0.002	LD	LD
Selenium (R)	LD	LD	LD	LD
Silver	0.01	0.01	0.01	0.01

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (R) indicates spike sample recovery was not within control limits.



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TABLE 44

CISTERN SOIL SAMPLING  
EP TOXICITY ANALYSES

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4
Sample Number	SSM-132	SSM-136	SSM-140	SSM-147
Sample Depth (ft)	13.0-14.5	13.0-14.5	13.0-14.5	13.0-14.5
Parameter (mg/l)				
Arsenic	LD	LD	LD	LD
Barium	LD	LD	0.07	LD
Cadmium	LD	LD	LD	LD
Chromium (T)	LD	LD	LD	LD
Lead	LD	LD	LD	LD
Mercury	0.005	LD	LD	LD
Selenium (R)	LD	LD	LD	LD
Silver	0.01	0.01	0.01	0.01

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (R) indicates spike sample recovery was not within control limits.



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TABLE 45

CISTERN BORINGS  
PERCHED WATER ORGANIC ANALYSES

*Process Bldg*

Sample Location	SB-36	SB-36A	SB-37
Sample Number	SS-24	SS-27	SS-19
Sample Date	9/18/86	9/18/86	9/18/86
Parameter (mg/l)			
Acetone	220.0	230.0	LD
Methylene Chloride	380.0	460.0	LD
2-Butanone	430.0	420.0	LD
Toluene	24.0	25.0	160.0
Isopropyl Alcohol	LD	30.0 (J)	LD
4-Methyl, 2-Pentanone	36.0 (J)	31.0 (J)	LD
Hexanone	360.0	240.0	LD
Tetrahydrofuran	70.0 (J) <sup>(3)</sup>	LD	LD
TOC	42,000.	38,500	49.9
TOX	49.	68	0.300

NOTES:

1. LD indicates less than the detection limit.
2. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample refer to the laboratory reports in Appendix C.
3. Result includes the concentration of propyl furan.
4. -- indicates parameter was not analyzed.
5. J indicates compound identified at a concentration below the detection limit.



Soil samples were also collected during the drilling of soil borings SB-34, SB-35, SB-37 and SB-38. The results of these samples are shown in Table 46. With the exception of a soil sample collected in soil boring SB-38 between 3.5 to 5.0 ft., the samples contained low levels of VOCs. The SB-38 sample collected between 3.5 to 5.0 ft. contained 146 mg/kg total VOCs. However, the deeper sample (12.5 to 13.5 ft.) from this boring contained 1.8 mg/kg total VOCs.

#### 6.7 Neutralization Pits

In April 1986, isopropyl ether was detected in background soil boring SB-14. The boring was relocated and redrilled as discussed in Section 5.0. The occurrence of isopropyl ether was investigated and conversations with plant personnel indicated that isopropyl ether was an acid base compound containing sulfuric acid and phosphoric acid at concentrations of 25% and 15%, respectively. It was also determined that there was a single instance discharge of off-spec isopropyl ether product to the neutralization pits for treatment. Isopropyl ether is not a regulated substance and is not on the Hazardous Substance List (HSL). To verify that there were no other organic chemicals discharged to the neutralization pits, soil samples collected from the pits were analyzed for organic chemicals.

The results of the organic analyses of samples from the neutralization pits are shown in Tables 47 and 48. Concentrations of VOCs, except isopropyl ether, were similar to concentrations detected in background soil sample. Isopropyl ether was detected at 1175 ug/kg at 9.5 to 11.0 ft. in the east neutralization pit and at 60 ug/kg in the west neutralization pit at similar depth.

Samples from soil borings SB-14, SB-43, PH-1 and PH-2-3 were sent to the laboratory for organics analysis to define the extent of the isopropyl ether in the ground and to verify that other organics were not present. The locations of these borings are shown in Drawing No. 1, the laboratory data is shown in Table 49. Other than isopropyl



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TABLE 46

CISTERN BORINGS

Sample Location	SB-34	SB-35	SB-37	SB-38	SB-38
Sample Number	SS-17	SS-6	SS-22	SS-11	SS-13
Sample Depth (ft)	3.5-5.0	17.5-18.0	12-13.5	3.5-5.0	12.5-13.5
Parameter (mg/kg)					
Methylene Chloride	0.012	0.510	0.074	11 (J)	0.130
Acetone	0.210	0.130	0.230	LD	0.570
2-Butanone	0.013 (J)	0.041 (J)	0.016 (J)	LD	0.170
1,1,1 Trichloroethane	LD	0.110	LD	LD	0.015
Trichloroethylene	LD	0.110	LD	LD	LD
Benzene	LD	LD	LD	LD	0.013 (J)
4-Methyl-2 Pentanone	LD	0.026 (J)	LD	LD	0.069
Tetrachloroethylene	LD	0.600	LD	LD	0.026
Toluene	LD	0.100	LD	37	0.250
Ethyl Benzene	LD	0.043	LD	16 (J)	0.029
Total Xylenes	LD	0.250	LD	82	0.110
1,1,2-Trichloro					
1,2,2-Trifluoroethane	LD	LD	0.7 (J)	LD	0.400 (J)
Propane, 2-2' Oxybis	LD	LD	LD	LD	0.020 (J)
Total VOCs	0.235	1.92	1.02	146	1.802
OVA Reading (ppm)	100	100	3.5	GT 1000	12

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.



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TABLE 47

WEST NEUTRALIZATION PIT  
ORGANIC ANALYSES

Sample Location	SB-39 and SB-40 (1)	
Sample Number	SS-122	SS-123
Sample Depth (ft)	4.5-6.0	9.5-11.0
Parameter (ug/kg)		
Methylene Chloride	89	68
Acetone	44	78
Toluene	1 (J)	LD
1,1,2 Trichloro- 1,2,2 Trifluoroethane	100 (J)	20 (J)
Chloroform	LD	21
Propane, 2,2'-Oxybis (isopropyl ether) (3)	LD	60 (J)
Trimethylsilanol (3)	LD	6 (J)
Total VOCs	234	253
OVA Readings	--	--

NOTES:

1. Sample numbers SS-122 and SS-123 were composite samples of soil borings SB-39 and SB-40.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. Compound is not a regulated hazardous chemical.
4. (LD) indicates less than the detection limit. Detection limits are sample specific due to concentration samples of organics in samples. For the detection limit of a specific sample refer to the laboratory results in Appendix C.



TABLE 48

EAST NEUTRALIZATION PIT  
ORGANIC ANALYSES

Sample Location	<u>SB-41 and SB-42 (1)</u>					
Sample Number	SS-124	SS-124 RA	SS-124 DUP	SS-124 DUP RA	SS-124 BLANK	SS-126
Sample Depth (ft)	0-3.0	0-3.0	0-3.0	0-3.0	NA	9.5-11.0
Parameter (ug/kg)						
Methylene Chloride	18	12	77	11	29	37
Acetone	38	35	100	32	LD	82
Toluene	15	10	LD	LD	LD	
Trimethylsilanol (2)	10 (J)	10 (J)	40 (J)	9 (J)	LD	60 (J)
1,1,2-Trichloro- 1,2,2-Trichloroethane	LD	100 (J)	LD	LD	LD	LD
Propane, 2-2'-Oxybis (isopropyl ether) (2)	LD	LD	LD	LD	LD	1000 (J)
Total VOCs	81	167	217	52	29	1179
OVA Readings	--	--	--	--	--	--

NOTES:

1. Sample numbers SS-124 and SS-126 were composite samples of soil borings SB-41 and SB-42.
2. Compound is not a regulated hazardous chemical.
3. Surrogate recovery of Toluene-D8 was outside QC limits due to matrix interference of samples SS-124 and SS-124 duplicate. Samples were reanalyzed (SS-124 RA and SS-124 duplicate RA and surrogate recoveries were again outside QC limits due to matrix interference. See "Sail Surrogate Percent Recovery Summary" in Appendix C.
4. LD indicates indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.



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TABLE 49

NEUTRALIZATION PIT AREA  
ORGANIC ANALYSES

Sample Location	SB-14	SB-14	SB-43	PH-1	PH-2&3
Sample Number	SS-117	SS-118	SS-114	PH-1	PH-2&3
Sample Depth (ft)	3.0-4.5	4.5-6.0	See Note 1	See Note 2	See Note 2
Parameter (ug/kg)					
Methylene Chloride	80	78	12	12	15
Acetone	85	76	22	24	23
Toluene	38	27	3 (J)	2 (J)	2 (J)
Propane, 2-2' Oxybis (Isopropyl Ether)	2000 (J)	2000 (J)	LD	LD	LD
4-Methyl-2 Pentanone	LD	LD	LD	LD	2 (J)
Xylene	LD	LD	LD	1 (J)	3 (J)
Total VOCs	2203	2181	37	38	42
OVA Readings	12	9.5	--	--	--

NOTES:

1. Samples were collected at 0.5-1.0 feet, 1.5-3.0 feet, 3-4.5 feet and 8-9.5 feet, and composited.
2. Sample No. PH-1 is a composite of soil samples collected from 0 to 5.0 feet. Sample No. PH 2-3 is a composite of soil samples collected at PH-2 and PH-3 from 1.5-3.0 feet.
3. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
4. (J) indicates compound identified at a concentration estimated below the detection limit.
5. (--) indicates parameter not analyzed.



ether, the VOC concentrations in these samples were similar to background. The concentration of isopropyl ether at a depth of 3.0 to 6.0 ft. in soil boring SB-14 was 2000 ug/kg, however, isopropyl ether was not detected in soil boring SB-43. The extent of isopropyl ether in the ground to the north of the neutralization pits is therefore limited to the area between SB-14 and SB-43. The vertical extent of isopropyl ether in the soil is approximately 9.5 to 11 ft.

Results of total metals analyses (Table 50) indicate elevated levels of iron and copper in samples collected from both pits. Iron concentrations ranged from 28,700 to 68,300 mg/kg. Copper concentrations ranged from 26 mg/kg to 657 mg/kg. Concentrations of other metals were similar to those detected in background soil samples.

Two soil samples (PH-1, PH-2-3) were collected to the north of the neutralization pits and analyzed for total metals. The analytical results are shown in Table 51 and are similar to the results of metals analyses on samples collected from the neutralization pits and background soil samples. Samples PH-2 and PH-2-3 were not analyzed for iron, copper or nickel.

#### 6.8 No Free Liquid Container Storage Area

Five soil borings were drilled along the perimeter of the container storage area located to the east of the HCC facility (Drawing No. 1). Samples were collected from the borings for organics and metals analyses. The results of the analyses are shown in Table 52. Groundwater was not encountered in the Well F borehole and Well F was installed in soil boring SB-46.

In general, VOC concentrations decreased with depth in soil borings SB-46, SB-47, SB-49 and in the Well F borehole. Elevated levels of total VOCs (146 mg/kg) were detected at 2 to 3.5 ft. in the Well F borehole, however, OVA readings approached background at approximately 17.0 ft. The 17 foot depth was not analyzed by the laboratory. Soil samples collected from soil boring SB-46 at 4.5 to



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TABLE 50

NEUTRALIZATION PITS  
TOTAL METALS ANALYSES

Sample Location	<u>West Pit</u>			<u>East Pit</u>		
	<u>SB-39 and SB-40</u> (1)			<u>SB-41 and SB-42</u> (2)		
Sample Number	NPS C-1	NPS C-2	NPS C-3	NPS C-4	NPS C-5	NPS C-6
Sample Depth (ft)	0-3.0	4.5-6.0	9.5-11.0	0-3.0	4.5-6.0	9.5-11.0
Parameter (mg/kg)						
Arsenic (*)	16	6.1	9.6	38	14	11
Barium (*)	98	55	45	98	54	51
Cadmium	LD	LD	3.4	4.9	LD	LD
Chromium (T) (R)	26	12	17	LD	38	15
Copper (R)	657	41	26	203	110	27
Iron	68,300	30,900	39,400	67,600	33,800	28,700
Lead	159	29 (+)	17	92 (+)	88 (+)	15 (S)
Mercury (R)	LD	LD	LD	0.12	LD	LD
Nickel	LD	LD	35	35	54	30
Selenium	LD	LD	LD	LD	LD	LD
Silver	LD	LD	LD	LD	LD	LD
Solids %	81	81	88	81	82	87

NOTES:

1. Sample numbers NPS C-1, NPS C-2, and NPS C-2 were composite samples of soil borings SB-39 and SB-40.
2. Sample numbers NPS C-4, NPS C-5, and NPS C-6 were composite samples of soil borings SB-41 and SB-42.
3. LD indicates less than the detection limit. For detection limits of a specific sample refer to the laboratory results in Appendix C.
4. R indicates that spike sample recovery was not within control limits.
5. + indicates that the correlation coefficient for method of standard addition is less than 0.995.
6. \* indicates that duplicate analysis areas not within control limits.
7. S indicates value determined by method of standard addition.



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TABLE 51

NEUTRALIZATION PIT AREAMETALS ANALYSES

Sample Location	PH-1	PH-3	PH-2 & PH-3
Sample Number	PH-1	PH-3	PH-2-3
Sample Depth	See Note 1	See Note 1	See Note 1
Parameter (mg/kg)			
Arsenic	17	14	21
Barium	59	53	99
Cadmium	7.1	LD	7
Chromium (T)	LD	32 (R)	324 (R)
Lead	44 (R)	20 (*)	72 (S)(*)
Mercury	LD	LD	LD
Selenium, (R)	LD	LD	LD (R)
Silver	LD (R)	9.9	LD
% Solids	84	76	86

NOTES:

1. Sample No. PH-1 is a composite of soil samples collected from 0 to 5.0 feet. Sample No. PH-2-3 is a composite of samples from 1.5 to 3.0 ft. at location PH-2 and PH-3. PH-3 is a composite of soil collected from 0 to 1.5 ft.
2. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample refer to the laboratory results in Appendix C.
3. R indicates that spike sample recovery was not within control limits.
4. \* indicates that duplicate analysis areas not within control limits.
5. (S) indicates determined by method of standard addition. PH-3 is a composite of soil collected from 0 to 1.5 ft.



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TABLE 52

CONTAINER STORAGE AREA  
ORGANIC ANALYSES

Sample Location	Boring Well F	SB-46	SB-46	SB-47	SB-47	SB-48	SB-49	SB-49
Sample Number	SS-29	SS-41	SS-45	SS-50	SS-52	SS-60	SS-63	SS-66
Sample Depth (ft)	2.0-3.5	4.5-6.0	21.0-21.4	3.0-4.5	9.0-10.5	16.5-17.0	3.5-5.0	16.5-16.8
Parameter (mg/kg)								
Methylene Chloride	41.0 (J)	51.0	0.051	3.4	2.6	0.017	19.0	0.008
Acetone	LD	LD	0.090	4.0	3.9	0.048	16.0	0.040
Trans-1,2-Dichloroethylene	LD	18.0 (J)	0.080	LD	LD	LD	LD	LD
2-Butanone	LD	LD	0.038 (J)	4.9	4.9	0.012 (J)	17.0	0.015
4-Methyl-2-Pentanone	LD	LD	LD	LD	LD	LD	LD	0.004 (J)
Toluene	17.0 (J)	230.0	0.081	12.0	LD	0.011	LD	0.006
Ethyl Benzene	9.0 (J)	230.0	0.027	2.7	LD	LD	LD	LD
Total Xylene	79.0 (J)	1800.0	0.220	5.2	LD	LD	LD	LD
Trimethylsilanol	LD	LD	0.030 (J)	LD	LD	0.020 (J)	LD	0.005 (J)
Hexane	LD	LD	0.060 (J)	LD	LD	LD	LD	LD
2-Methyl-Hexane	LD	LD	0.030 (J)	LD	LD	LD	LD	LD
1-Ethyl-4-Methyl Benzene	LD	LD	LD	LD	LD	LD	30.0 (J)	LD
Total VOCs	146	2329	0.707	32.2	11.4	0.108	82	0.078
OVA Readings	GT 1000	GT 1000	35	340	20	8	200	3.5

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. Monitor Well F was installed in Soil Boring SB-46. No water was encountered during the drilling of Boring Well F.
4. Surrogate recoveries of Toluene-D8 and Bromofluorobenzene were outside QC limits due to matrix interference. See "Soil Surrogate Percent Recovery Summary" in Appendix C.
5. GT indicates greater than.



6.0 ft. showed a total VOC concentration of 2029 mg/kg which declined to 0.707 mg/kg at 21 ft. VOCs in soil samples collected from soil boring SB-47 at 3.0 to 4.5 ft. and 9.0 to 10.5 ft. were 32.2 mg/kg and 11.4 mg/kg, respectively.

VOC concentrations in soil boring SB-48 were at or near the concentrations of the background soil samples. OVA readings showed background over the entire depth (0.5 to 17.0 ft.) of this boring. VOC concentrations in samples collected at boring SB-49 were 82.0 mg/kg and 0.078 mg/kg at depths of 3.5 to 5.0 ft. and 16.5 to 16.8 ft., respectively.

Results of metals analysis of soil samples collected at or near the sample depths collected for organic analyses are shown in Table 53. Concentrations of arsenic, barium, cadmium, selenium and silver were similar to the metals background in soil. Elevated levels of barium, lead, chromium and mercury were detected in soil boring SB-46 at a depth of 4.5 to 6.0 ft. Mercury levels higher than background were detected at 2.0 to 3.5 ft. in samples from the Well F borehole and at 3.0 to 4.5 ft. in soil boring SB-47.

#### 6.9 API Tank Basin Area

Two soil borings were drilled to the east of the containment basin which is located above the API tank and samples were collected for organic and metals analyses. The results of the analyses are shown in Tables 54 and 55. Boring locations are shown on Drawing No. 1.

Concentrations of VOCs detected in samples from soil boring SB-50 were 0.19 mg/kg and 0.115 mg/kg at 3.5 to 5.0 ft. and 12.5 to 13.5 ft., respectively and were similar to those detected in background soil samples. Total VOCs in soil boring SB-51 were 523.3 mg/kg at a depth of 8.0 to 9.5 ft., however, at 16.5 to 17.0 ft., the VOC concentrations decreased to 0.084 mg/kg, similar to background.



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TABLE 53

CONTAINER STORAGE AREA  
METALS ANALYSES

Sample Location	Well F Boring	SB-46	SB-47	SB-48	SB-49
Sample Number	SS-30	SS-41	SS-50	SS-60	SS-63
Sample Depth (ft)	2.0-3.5	4.5-6.0	3.0-4.5	16.5-17.0	3.5-5.0
Parameter (mg/kg)					
Arsenic (*)	16	12	12(S)	8.8	10
Barium (*)	78	234	80	36	72
Cadmium	LD	4.8	LD	LD	LD
Chromium (T) (R)	15	74	19	15	14
Lead	76	199	136	18	27
Mercury (R)	1.5	0.56	0.13	LD	LD
Selenium	LD	LD	LD	LD	LD
Silver	LD	LD	LD	LD	LD
% Solids	76	72	80	96	83

NOTES:

1. (\*) indicates duplicate analysis was not within control limits.
2. (R) indicates spike sample recovery was not within control limits.
3. (S) indicates concentration determined by method of standard addition.
4. LD indicates less than the detection limit. For the detection limit of a specific sample refer to the laboratory reports in Appendix C.
5. Monitor Well F was installed in soil boring SB-46. No water was encountered during the drilling of Boring Well F.



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TABLE 54

API TANK AREAORGANIC ANALYSES

Sample Location	SB-50	SB-50	SB-50	SB-50	SB-51	SB-51	SB-51
Sample Number	SS-77	SS-77 Dup.	SS-77 Blank	SS-79	SS-70	SS-70 RA	SS-72
Sample Depth (ft)	3.5-5.0	3.5-5.0	NA	12.5-13.5	8.0-9.5	8.0-9.5	16.5-17.0
Parameter (mg/kg)							
Methylene Chloride	0.034	0.023	0.031	0.018	4.3	4.2	0.016
Acetone	0.150	0.041	0.010	0.044	11.0	10.0	0.027
Tetrachloroethylene	LD	LD	LD	LD	3.0	3.0	LD
Toluene	0.006	0.023	0.004(J)	0.037	100.0	110.0	0.024
Ethyl Benzene	LD	LD	LD	LD	55.0	62.0	0.002(J)
Xylene	LD	LD	LD	LD	350.0	370.0	0.011
1,1,1 Trichloroethane	LD	LD	0.006	LD	LD	LD	LD
1,1,2 Trichloro-							
1,2,2 Trichloroethane	LD	LD	LD	0.008(J)	LD	LD	LD
Trimethylsilanol	LD	LD	LD	0.008(J)	LD	LD	LD
Trans-1,2 Dichloroethylene	LD	LD	LD	LD	LD	LD	0.004(J)
Total VOCs	0.19	0.087	0.051	0.115	523.3	559.2	0.084
OVA Readings	3.5	--	--	2.0	400	--	15

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. NA indicates not applicable.
4. Dup. indicates duplicate analysis
5. -- indicates parameter not analyzed.
6. RA indicates reanalysis by the laboratory. The percent difference for toluene was 33% in the laboratory's continuing calibration. The allowable limit is 25%, therefore actual Toluene concentrations may be slightly higher than reported for sample number SS-70 only. Surrogate recovery of Bromofluorobenzene was outside QC limits, due to matrix interference of sample SS-70. Sample number SS-70 was reanalyzed (SS-70RA). Surrogate for SS-70RA was also outside QC limits, due to matrix interference. See "Soil Surrogate Percent Recovery Summary" in Appendix C.



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TABLE 55

API TANK AREA  
METALS ANALYSES

Sample Location	SB-51
Sample Number	SS-70
Sample Depth (ft)	8.0-9.5
Parameter (mg/kg)	
Arsenic	8.5 (S) (*)
Barium	54 (*)
Cadmium	LD
Chromium (T)	17 (R)
Lead	19
Mercury	LD (R)
Selenium	LD
Silver	LD
% Solids	82

NOTES:

1. (\*) indicates duplicate analysis was not within control limits.
2. (R) indicates spike sample recovery was not within control limits.
3. (S) indicates concentration determined by method of standard addition.
4. LD indicates less than the detection limit. For the detection limit of a specific sample refer to the laboratory results in Appendix C.



Metals analyses on the soil sample showing the highest concentration of organics in soil boring SB-51 showed less than background (Table 55).

#### 6.10 Storm Water Collection System

A schematic of the HCC storm water drainage system is shown in Drawing No. 3. The drainage system discharges at Outfall No. 001. The storm water system was sampled by HCC personnel under EA's guidance in an effort to identify sources of elevated effluent levels of BOD, TOC and COD. Samples of standing water were collected at various points along the storm water collection system during dry weather periods and samples from the outfall were collected during dry and wet weather periods.

Sample COD was measured as the indicator parameter. COD analyses were performed by the HCC laboratory (Tables 56 and 57). Elevated levels of COD were detected in storm water collected from the area of the shipping dock and the east drive main <sup>Cistern area.</sup> interceptor. In addition, water seeping from the ground around the manhole of the east drive main interceptor and flow into the manhole also contained elevated levels of COD.

The results of Outfall 001 sampling and COD analyses versus flow rates show that there are elevated COD levels (2850 mg/l) under low flow conditions and COD levels decrease as the flow rate increases in wet weather (Table 57).

Visual inspection of the storm water collection system showed the following:

1. During dry weather periods, flow was observed from the north-south piping run into the east drive main interceptor manhole.



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TABLE 56

STORM WATER COLLECTION SYSTEM

<u>Sampling Location Number</u>	<u>COD (mg/l)</u>	
	<u>July 2, 1985</u>	<u>September 6, 1985</u>
1	260	100
2	160	90
3	0	200
4	4000	GT 6000
5	10	50
6A	GT 6000	GT 6000 <sup>3</sup>
6B	--	GT 6000 <sup>4</sup>
6C	--	GT 6000 <sup>5</sup>
7	3600	2600
Flow rate at outfall tank (gal/hr)	4	3

NOTES:

1. GT indicates greater than
2. (--) indicates no sample collected
3. Sample collected was standing liquid in the East Drive Main Interceptor.
4. Sample collected was liquid flow from the inlet of the North-South run at the East Drive Main Interceptor.
5. Sample collected was liquid seepage around the inlet of the East-West run at the East Drive Main Interceptor.



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TABLE 57

OUTFALL 001  
COD VS. FLOW RATE

<u>Date</u>	<u>Flow Rate (gal/hr)</u>	<u>COD (mg/l)</u>
6/28/85	9	2600
7/5/85	3	4000
7/5/85	180	675
7/9/85	4	2500
7/10/85	3600	0
7/10/85	257	10
7/10/85	95	50
7/11/85	7	1000



2. At the east drive main interceptor, there was no flow through the piping interconnecting the interceptor manhole and the API tank. Seepage around the interconnecting piping in the manhole of the east drive main interceptor was observed.
3. There was no flow through the east-west piping at the east drive main interceptor during dry weather periods. Seepage around the connection between the piping and the interceptor manhole was observed.

Sampling and laboratory analyses of the 001 outfall was performed by EA and OEPA. The analytical results of analyses are included in Tables 58 and 59. The flow rate at the outfall when OEPA collected its sample is not known and OEPA exceeded its sample holding time. The outfall flow rate when it was sampled by EA in October 1986 was approximately 30 gallons per hour. VOCs were detected in the discharge in samples collected by OEPA and EA.

#### 6.11 Groundwater and Surface Water Monitoring Results

All new and existing monitoring wells were sampled by EA in accord with the protocol described in EA's November 1985 report well locations are shown on Drawing No. 1. At the time this report was prepared, three quarterly sampling events were completed. Third quarter sampling of a limited number of wells was conducted in February 1987, pending USEPA and OEPA review of existing data.

Monitoring data for the May 1986 sampling are shown in Tables 60 and 61. The HCC upgradient well is identified as SW-1 which contained acetone (0.014 mg/l) and methylene chloride (0.001 mg/l) at concentrations are less than detected in the laboratory and field blanks.

As shown in Table 60, the highest levels of VOCs were detected at Monitoring Well C (methylene chloride 1300 mg/l). Other organics may be present at lower concentrations, but could not be detected at the



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TABLE 58

OUTFALL 001 SAMPLING RESULTS

Sample Location	Outfall 001
Sample Number	OP-001
Sample Date	10/2/86
Parameter (ug/l)	
Acetone	11,000
Methylene Chloride	2,800
Toluene	560 (J)
2-Butanone	3,300
4-Methyl, 2-Pentanone	17,000
TOC	67.4
TOX	1.3

308 ph

34.6 ppm  
VOC

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.



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TABLE 59

STATE ANALYSES

<u>Chemical</u> <u>(ug/l)</u>	<u>Upstream</u>	<u>Effluent</u> <u>(001 Outfall)</u>	<u>Downstream</u>
1,1-dichloroethane	K0.8	82.7	3.9
1,1,1-trichloroethane	6.6	440	20.5
1,1-dichloroethene	K1.1	16.5	K1.1
✓ trans-1,2-dichloroethene	18.5	98.8	21.7
trichloroethene	1.9	493	8.3
tetrachloroethene	12.2	38.2	2.1
vinyl chloride	K0.9	9.9	10.9
methylene chloride	K2.0	7,272	349
benzene	K0.7	19.1	K0.7
ethylbenzene	K0.2	162	0.5
toluene	0.6	1,779	4.1
1,2-dichlorobenzene	K0.5	22.7	0.5
1,3-dichlorobenzene	K0.2	3.6	K0.2
N-nitrosodiphenylamine	0.3	0.3	0.4
dimethylphthalate	K0.4	1.8	K0.4
di-n-butylphthalate	K0.5	0.5	K0.5
butylbenzylphthalate	K0.3	0.3	K0.3
bis(2-ethylhexyl)phthalate	1.5	3.8	2.6
naphthalene	K0.2	2.9	K0.2
phenanthrene	0.3	0.6	0.6

phenol

K0.7

16.0 10.5 ppm  
VOCK0.7 0.4 ppm  
VOCNOTES:

- Grab samples were collected by the Ohio EPA on March 28, 1985, and were analyzed for volatiles and acid and base neutral extractables. All samples exceeded QA/QC holding times. K = less than.
- This table is taken from OEPA's report, "Toxicity Evaluation Report on Surface Water Discharges," dated September 22, 1986, marked "Draft Subject to Revision".



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TABLE 60

GROUNDWATER MONITORING RESULTS  
ORGANIC ANALYSES  
MAY 1986 (FIRST QUARTER)

*Bkgd*

Sample Location	SW-1	SW-2 <sup>(3)</sup>	SW-3	SW-4	A	B	B, Duplicate	B, Blank	C
Sample Number	GW-7	--	GW-5	GW-4	GW-1	GW-2	GW-2	GW-2	GW-3
Sample Date	5/17/86	--	5/17/86	5/16/86	5/16/86	5/16/86	5/16/86	5/16/86	5/16/86
Parameter (mg/l)									
Methylene Chloride	0.001 (J)	--	0.003 (J)	0.042	LD	440.0	490.0	0.010	1300.0
Acetone	0.014	--	0.020	0.047	LD	92.0	LD	0.056	LD
2-Butanone	LD	--	LD	0.023	LD	LD	LD	0.013	LD
Toluene	LD	--	LD	0.005	0.030	LD	LD	0.004 (J)	LD
1,1 Dichloroethane	LD	--	LD	0.016	0.006	LD	LD	LD	LD
Xylene	LD	--	LD	LD	0.030	LD	LD	0.002 (J)	LD
Ethyl Benzene	LD	--	LD	LD	0.005	LD	LD	LD	LD
4-Methyl-2-Pentanone	LD	--	LD	0.009 (J)	LD	LD	LD	LD	LD
Propane 2,2-Oxybis (Isopropyl Ether) (4)	LD	--	LD	0.080 (J)	LD	LD	LD	LD	LD
TOC	2.8	--	73.9	22.6	1.4	59.8	71.1	1.4	107.0
TOX	0.040	--	0.270	0.200	0.010	22.0	180.0	LD	120.0

*0.01? Black Clay With wood.*

NOTES:

- LD indicates less than the detection limit.
- Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample refer to the laboratory reports in Appendix C.
- No sample was collected for analyses because bailer could not be retrieved from well SW-2. Problem was rectified in September 1986 and sample was collected for analyses.
- Propane 2,2' - oxybis (isopropyl ether) is not regulated as a hazardous substance.
- (J) indicates compound identified and concentration estimated below the detection limit.



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TABLE 61

GROUNDWATER MONITORING RESULTS  
INORGANIC ANALYSES  
MAY 1986 (FIRST QUARTER)

Sample Location	SW-1	SW-2 <sup>(2)</sup>	SW-3	SW-4	A	B	B, Duplicate	B, Blank	C
Sample Number	GW-7	--	GW-5	GW-4	GW-1	GW-2	GW-2	GW-2	GW-3
Sample Date	5/17/86	--	5/17/86	5/16/86	5/16/86	5/16/86	5/16/86	5/16/86	5/16/86
Parameter (mg/l)									
Arsenic	LD	--	LD	LD	LD	LD	LD	LD	LD
Barium	LD	--	LD	0.210	LD	0.190	0.190	LD	0.100
Cadmium	LD	--	LD	LD	LD	LD	LD	LD	LD
Chromium	LD	--	LD	LD	LD	LD	LD	LD	LD
Lead	LD	--	LD	LD	LD	LD	LD	LD	LD
Mercury	LD	--	LD	LD	LD	LD	LD	LD	LD
Selenium (3)	LD	--	LD	LD	LD	LD	LD	LD	LD
Silver	LD	--	LD	LD	LD	LD	LD	LD	LD
pH	8.05	--	7.39	7.08	6.20	6.06	--	6.96	5.78
Conductivity-umohs/cm	3600	--	9250	4750	8750	6990	--	5.1	4700

NOTES:

1. LD indicates less than the detection limit. Detection limits are provided in the laboratory reports in Appendix C.
2. See Note 3, Table 60.
3. Spike sample recovery for selenium analysis was not within the control limits.
4. -- indicates parameter not analyzed.



detection limit required to identify the concentration of methylene chloride. Methylene chloride concentrations decrease from Well C to Well B, where the concentration was 440 mg/l. In addition to methylene chloride, a sample from Well B also contained acetone (92 mg/l) and a trace level of 1,1-dichloroethane (0.006 mg/l). However, neither acetone nor 1,1-dichloroethane were detected in a duplicate sample collected from Well B. Well SW-4 contained trace levels of methylene chloride (0.042 mg/l) as well as other VOCs. Well A contained no detectable methylene chloride, but did contain low concentrations of toluene (0.03 mg/l), 1,1-dichloroethane (0.016 mg/l), xylene (0.03 mg/l) and ethylbenzene (0.005 mg/l).

Well SW-3 contained acetone and methylene chloride at concentrations of 0.02 mg/l and 0.003 mg/l, respectively which is less than detected in both the field and laboratory blanks.

TOC and TOX values were greater than upgradient values in Wells SW-3, SW-4, Well B and Well C. The groundwater sample collected from Well SW-3, SW-4, Well B and Well C had an odor similar to that produced by anaerobic decomposition of organic matter.

Table 61 shows the inorganic analytical results from the May 1986 sampling. Except for barium, no heavy metals were detected in any of the groundwater samples. Barium was detected in Wells SW-4, Well B, Well B Duplicate and Well C groundwater samples at 0.21 mg/l, 0.19 mg/l, 0.19 mg/l and 0.1 mg/l, respectively.

The pH of the upgradient well was 8.05. Lower pH values were measured in each of the groundwater samples collected from the downgradient monitor wells. The lowest pH values were detected at Well C (5.78).

Monitoring data for the September/October 1986 sampling are shown in Tables 62 and 63. Upgradient concentrations of methylene chloride and toluene were 0.180 mg/l and 0.002 mg/l, respectively. Samples from Wells B, C, F and G contained elevated levels of VOCs. Wells C,



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TABLE 62

GROUNDWATER MONITORING RESULTS  
ORGANIC ANALYSES  
SEPTEMBER/OCTOBER 1986 (SECOND QUARTER)

Sample Location	SW-1	SW-2	SW-3	SW-4	A	B	C	E	F	F, Duplicate	F Blank	G
Sample Number	GW-1	GW-9	GW-2	GW-4	GW-3	GW-5	GW-6	GW-10	GW-7	GW-7	GW-7	GW-8
Sample Date	9/20/86	10/1/86	9/20/86	9/20/86	9/20/86	9/21/86	9/21/86	10/2/86	10/1/86	10/1/86	10/1/86	10/1/86
Parameter (mg/l)												
Methylene Chloride	0.180	0.007	0.100	0.170	0.170	610.0	1500.0	LD	0.047	0.007	LD	270.0
Toluene	0.002(J)	LD	LD	0.003(J)	0.002(J)	LD	LD	LD	LD	0.006	LD	3.6(J)
Xylene	LD	LD	LD	LD	LD	LD	LD	LD	0.012	0.017	LD	LD
1,2 Diethoxyethane	LD	LD	0.020(J)	LD	LD	LD	LD	LD	LD	LD	LD	LD
1,1 Dichloroethane	LD	LD	LD	0.012	LD	LD	LD	LD	LD	LD	LD	LD
2-Methyl, 2-Propanol	LD	LD	LD	0.010	LD	LD	LD	LD	LD	LD	LD	LD
2,2' Propane, Oxybis	LD	LD	LD	0.100	LD	LD	LD	LD	LD	LD	LD	LD
Vinyl Chloride	LD	LD	LD	LD	LD	LD	LD	LD	0.024	0.030	LD	LD
Trans, 1,2,- Dichloroethylene	LD	LD	LD	LD	LD	LD	LD	LD	0.240	0.250	LD	LD
TOC	7.6	20.9	83.8	9.6	1.3	83.8	134.0	4.6	5.5	5.7	1.1	44.5
TOX	LD	0.022	0.180	0.016	LD	25.0	40.0	0.026	0.170	0.160	0.011	53.0

NOTES:

1. Wells E, F and G were installed in September 1986.
2. LD indicates less than the detection limit.
3. Isopropyl ether (2-2' Oxybispropane) is not a regulated hazardous chemical.
4. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory reports in Appendix C.



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TABLE 63

GROUNDWATER MONITORING RESULTS  
INORGANIC ANALYSES  
SEPTEMBER/OCTOBER 1986 (SECOND QUARTER)

Sample Location	SW-1	SW-2	SW-3	SW-4	A	B	C	E	F	F, Duplicate	F Blank	G
Sample Number	GW-1	GW-9	GW-2	GW-4	GW-3	GW-5	GW-6	GW-10	GW-7	GW-7	GW-7	GW-8
Sample Date	9/20/86	10/1/86	9/20/86	9/20/86	9/20/86	9/21/86	9/21/86	10/2/86	10/1/86	10/1/86	10/1/86	10/1/86
Parameter (mg/l)												
Arsenic (I)	LD	LD	LD	LD	LD	0.018	LD	LD	LD	LD	LD	LD
Barium	LD	0.070	LD	LD	LD	0.280	0.090	LD	0.090	0.090	LD	0.140
Cadmium	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD
Chromium (T)	0.010	0.018	0.012	LD	LD	LD	LD	0.012	0.022	LD	LD	LD
Lead (I) (2)	LD	0.014	.006	LD	0.018	LD	LD	LD	LD	0.010	LD	LD
Mercury	0.001	0.0027	0.0003	0.0006	0.001	0.0009	0.0008	0.0007	0.0005	--	LD	0.0003
Selenium	LD	LD	(S)	LD	LD	LD	LD	LD	LD	LD	LD	LD
Silver	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD
pH	7.12	6.84	7.54	7.10	6.32	6.11	5.87	6.37	7.74	--	--	6.82
Conductivity-umohs/cm	3000	1350	9500	3500	1400	3250	1700	1750	1800	--	--	4000

NOTES:

1. Spike sample recovery was not within the control limits.
2. Duplicate analysis was not within the control limits.
3. NA is not applicable.
4. -- indicates parameter not analyzed
5. Detection limits are provided in the laboratory reports in Appendix C.
6. (S) indicates concentration determined by method of standard addition.



B and G contained methylene chloride at concentrations of 1500 mg/l, 610 mg/l and 270 mg/l, respectively. In addition to methylene chloride, the sample from Well G contained 3.6 mg/l of toluene.

The sample from Well F contained less methylene chloride than the upgradient well. The Well F sample also contained trans, 1,2-dichloroethylene at 0.24 mg/l, vinyl chloride (0.024 mg/l) and xylene (0.012 mg/l). No VOCs were detected at Well E and Well SW-2 contained a trace level of methylene chloride at 0.007 mg/l. The Well SW-4 sample contained low levels of VOCs.

Results of heavy metals analyses, pH and conductivity are shown in Table 63. Cadmium, selenium or silver were not detected in any of the groundwater samples. Monitoring Well B contained 0.018 mg/l of arsenic. No other samples contained arsenic.

Barium was detected in samples from Wells B, C, E and F at concentrations ranging from 0.06 mg/l to 0.028 mg/l. Chromium was detected in samples collected from SW-1 (upgradient), SW-2, SW-3, E and F. Concentrations ranged from 0.01 mg/l (SW-1) to 0.022 mg/l (Well F). Lead was detected in samples from Wells SW-2, Well A and the Well F duplicate at concentrations of 0.014 mg/l, 0.018 mg/l and 0.01 mg/l, respectively. Mercury was detected in all groundwater samples, except the Well F duplicate. Concentrations ranged from 0.0003 mg/l in Well G to 0.0027 mg/l in Well SW-2. The concentration of mercury in upgradient groundwater was 0.001 mg/l.

The pH of groundwater samples decreased from upgradient to downgradient with the lowest pH value measured at Well C (5.87).

In addition to the heavy metals, additional inorganic analyses were performed on select groundwater samples collected in September/October 1986. Results of these analyses are shown in Table 64.



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TABLE 64

GROUNDWATER MONITORING RESULTS  
INORGANIC ANALYSES  
SEPTEMBER/OCTOBER 1986

Sample Location	SW-1	SW-2	SW-3	SW-4	A	B	C	E	F	F, Duplicate	F Blank	G
Sample Number	GW-1	GW-9	GW-2	GW-4	GW-3	GW-5	GW-6	GW-10	GW-7	GW-7	GW-7	GW-8
Sample Date	9/20/86	10/1/86	9/20/86	9/20/86	9/20/86	9/21/86	9/21/86	10/2/86	10/1/86	10/1/86	10/1/86	10/1/86
Parameter (mg/l)												
Copper	0.037	0.488	0.025	--	--	--	--	0.074	0.023	0.031	0.023	0.028
Iron	1.2	19.60	0.200	--	--	--	--	23.8	0.580	0.670	LD	--
Nickel	LD	LD	LD	--	--	--	--	LD	LD	LD	LD	0.179
Manganese	--	6.720	--	--	--	--	--	2.420	0.068	0.062	LD	3.580
Zinc	--	1.230	--	--	--	--	--	0.367	0.054	0.052	0.041	2.340
Chloride	16.0	84.0	330.0	--	--	--	--	530.0	170.0	170.0	LD	490.0
Fluoride	0.7	0.30	0.20	--	--	--	--	0.2	0.80	0.70	LD	0.70
Phosphorus (T)	LD	0.20	LD	--	--	--	--	LD	LD	LD	LD	LD
Sulfate	480.0	93.0	2200.0	--	--	--	--	135.0	77.0	75.0	LD	142.0

NOTES:

1. LD indicates less than the detection limit.
2. -- indicates parameter was not analyzed.
3. Refer to laboratory results in Appendix C for detection limits.



Copper was detected at concentrations greater than upgradient (0.037 mg/l) in samples from Wells SW-2 (0.488 mg/l) and Well E (0.074 mg/l). Concentrations of iron in samples from Wells SW-2 and E (19.6 mg/l and 23.8 mg/l) were greater than upgradient concentrations (1.2 mg/l). Nickel was detected in Well G at 0.179 mg/l. No nickel was detected in the upgradient groundwater sample.

Samples from Wells SW-2, E, F and G were analyzed for manganese. The Well F sample contained 0.068 mg/l. Wells SW-2, E and G contained 6.72 mg/l, 2.42 mg/l and 3.58 mg/l, respectively. Well F contained 0.054 mg/l of zinc and Wells SW-2, E and G contained 1.23 mg/l, 0.367 mg/l and 2.34 mg/l of zinc.

Downgradient chloride concentrations were greater than upgradient concentrations (16.0 mg/l) in Wells SW-2, SW-3, E, F and G. Results of fluoride analysis showed that the samples analyzed contained less than upgradient concentrations, except for the Well F sample which contained 0.8 mg/l of fluoride. The upgradient concentration was 0.07 mg/l.

Results of total phosphorous analysis show that phosphorous was detected only in the groundwater sample collected from Well SW-2 (0.02 mg/l). Results of sulfate analysis showed that the upgradient groundwater contained 480 mg/l. Downgradient wells, except SW-3, contained less than upgradient sulfate concentrations. Well SW-3 contained 2200 mg/l of sulfates.

Pending USEPA and OEPA review of existing groundwater data, it was agreed that limited third quarter groundwater sampling would be performed. A decision was made to sample wells at the outside perimeter of a suspected methylene chloride plume emanating from the tank farm. The sampling results are shown in Table 65.

As shown, low levels of VOCs were detected in Wells A, SW-3 and SW-4. Well G, located at the tributary to Tinker's Creek contains



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TABLE 65

GROUNDWATER MONITORING RESULTS  
ORGANIC ANALYSES  
FEBRUARY 1987 (THIRD QUARTER)

Sample Location	Well A	Well A Duplicate	SW-3	SW-4	Well G
Sample Number	W-1	W-1A	W-2	W-3	W-4
Sample Depth (ft)	2/20/87	2/20/87	2/20/87	2/20/87	2/20/87
Parameter (mg/l)					
Methylene Chloride	LD	LD	0.005	0.230	730
Acetone	0.026	0.029	0.004 (J)	0.190	730
Vinyl Chloride	LD	LD	LD	0.012	LD
1,1 Dichloroethane	0.007	0.006	LD	0.013 (J)	LD
Trans, 1-2 Dichloroethylene	LD	LD	LD	0.014 (J)	LD
Ethyl Ether	LD	LD	0.022 (J)	LD	LD
1,4-Dioxane	LD	LD	0.009 (J)	LD	LD
Isopropyl Ether (3)	LD	LD	LD	0.097 (J)	LD

NOTES:

1. LD indicates less than the detection limit.
2. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample refer to the laboratory reports in Appendix C.
3. Isopropyl ether is not regulated as a hazardous substance.
4. (J) indicates compound identified and concentration estimated below the detection limit.



elevated levels of acetone (730 mg/l) and methylene chloride (740 mg/l). Methylene chloride increased from 270 mg/l detected in October 1986. Acetone was not detected in previous samples from Well G.

#### 6.12 Surface Water Sampling

*What is outfall vs. air discharge impact?*

Surface water samples of the tributary to Tinkers Creek were collected by EA and sent to the laboratory for organics analysis. An upstream sample was collected to the east of the HCC facility, where the tributary enters the property through a culvert. A downstream sample was collected from the tributary at a location northwest of the HCC facility. The results are shown in Table 66.

*↑ where*

Acetone was the only VOC detected in the upstream sample (21 ug/l). This concentration was less than detected in the laboratory blanks. Acetone was not detected in the upstream duplicate or field blank samples. The downstream surface water sample contained trace levels of VOCs. Xylene, trans, 1,2-dichloroethane and isopropyl ether were detected in the downstream samples at concentrations of 4 ug/l, 8 ug/l and 10 ug/l, respectively.

The tributary to Tinkers Creek was also sampled by OEPA in 1985. The results of the OEPA's analyses are presented in Section 6.10, Storm Water Collection System. Surface water sampling by EA was conducted during a dry weather period. At this time, the flow rate of storm water Outfall No. 001 was 30 gal/hr. The flow rate of this outfall when it was sampled by OEPA is not known.

*Flow rate of Tinkers Creek?*

*see page 108 for outfall*



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TABLE 66

SURFACE WATER SAMPLING RESULTS  
ORGANIC ANALYSES

*What was flow rate for tributary etc. of Tinkers Creek Tributary*

*High TOL*

Sample Location	Upstream	Duplicate	Blank	Downstream
Sample Number	STR-1	STR-1	STR-1	STR-2
Sample Depth (ft)	10/2/86	10/2/86	10/2/86	10/2/86
Parameter (ug/l)				
Acetone	21	LD	LD	LD
<i>methylene chloride</i> Xylene	LD	LD	LD	4 (J)
<i>Toluene</i> Trans, 1,2 Dichloro-ethane	LD	LD	LD	8
<i>2-Butanone</i> Propane, 2-2' Oxybis	LD	LD	LD	10 (J)
<i>A-methyl, 2-Pentanone</i> TOC (mg/l)	18.8	26.2	1.5	68.1
TOX (mg/l)	0.049	0.055	0.010	0.062

*30 gph Outfall 08-001 10/2/86*

NOTES:

- LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory reports in Appendix C.
- (J) indicates compound identified and concentration estimated below the detection limit.



## 7.0 DISCUSSION OF RESULTS

### 7.1 Solvent Tank Farm

The areal extent of VOCs detected in the soil in and around the tank farm and the cistern is shown in Figure 16. The vertical distribution and extent of VOCs in the soil are shown in cross sections A-A, B-B and C-C shown in Section 6.3. In general, the vertical extent of VOC contamination in the tank farm and to the east of the tank farm is the depth of groundwater (17 ft. to 24 ft.). The variations in concentrations, depth and in the particular compounds detected in the soil samples indicate that their occurrence is the result of surface spills which explains the variability in VOC concentrations by location and depth.

*What about sump  
contributions?*

In general, the highest VOC concentrations in the tank farm were detected in and around soil boring SB-7 between grade and 4.5 ft. deep. From 4.5 ft. to the depth of weathered shale (approximately 12.0 to 13.0 ft.) in the tank farm, highest VOC concentrations were detected in the areas of soil borings SB-3 and SB-6.

*SE C Sump Effects.*

*SB6 - Till: Floaters SB3 - Shale: sinkers.*

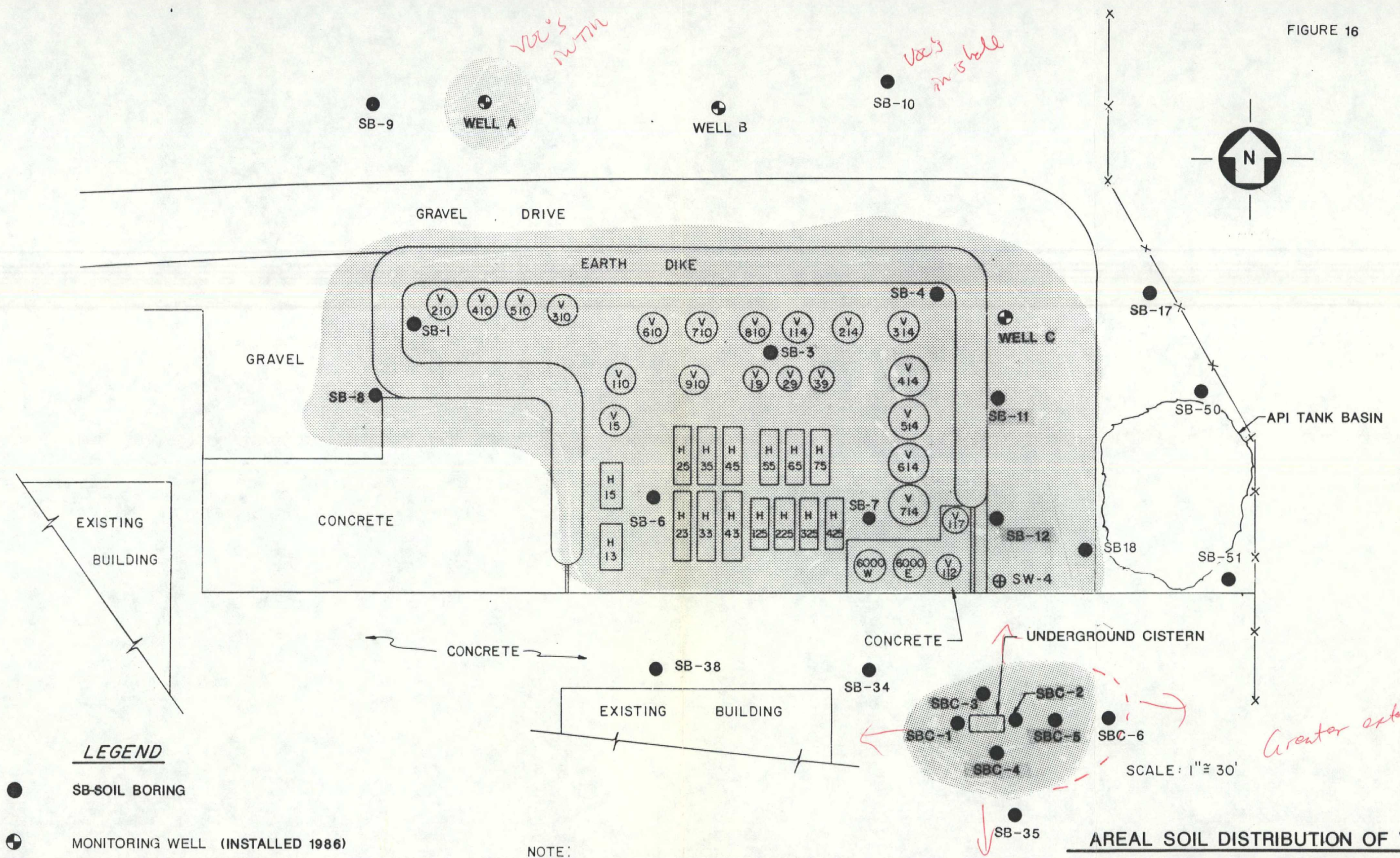
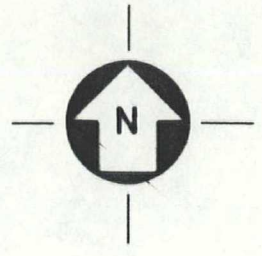
Outside the berm of the tank farm, the highest concentrations of VOCs between grade and 4.5 ft. deep, were detected in the areas of soil borings SB-11 and SB-18. Between 4.5 ft. and the depth of groundwater (20.5 ft. to 24 ft.), highest VOCs were detected in the area of soil boring SB-11 at 12.0 to 13.5 ft.

*SB18 - Till: Floaters  
SB11 - Till: Floaters  
SB11 - Till/Shale: Floaters*

Samples collected from the boring of Well A contained 49.72 mg/kg of VOCs at a depth of 7.5 to 9 ft. and it cannot be determined whether contamination in this area is due to tank farm operations or to a local spill. However, soil samples from Well A between 16.5 to 17 ft. and 20.0 to 20.5 ft. contained only 0.132 mg/kg and 0.171 mg/kg of VOCs. Samples collected between grade and 7.5 ft. were screened using



FIGURE 16



**LEGEND**

- SB-SOIL BORING
- ⊕ MONITORING WELL (INSTALLED 1986)
- ⊕ MONITORING WELL (INSTALLED 1982)

NOTE:  
STORAGE TANKS SHOWN IN  
APPROX. LOCATION.

**AREAL SOIL DISTRIBUTION OF VOC'S  
IN & AROUND TANK FARM & CISTERN**

*Greater extent!*



the OVA, but were not submitted for laboratory analysis. OVA readings of samples collected at 0 to 1.5 ft. and 1.5 to 3.0 ft. were 3.4 ppm and 38.0 ppm, respectively. Groundwater samples collected at Well A contained only trace levels of VOCs.

Soil samples collected from soil boring SB-10 at or near the depth of groundwater (approximately 20 ft.) contained VOCs (43.1 mg/kg). These VOCs may be attributed to VOCs in groundwater, since low VOC levels were detected in the boring at 4.5 to 6.0 ft.

*M.C. Plume  
Not aligned with  
GW flow*

Metals analyses of three soil samples collected in the tank farm area characterized by the highest levels of VOCs show metals concentrations similar to background.

The extent and concentrations of contaminants in the groundwater around the tank farm are shown in Figures 17 and 18. These figures show methylene chloride isoconcentration contours based on first and second quarter groundwater sampling at the HCC site.

*Source*

The highest concentration of methylene chloride was detected at Well C, located near the northeast corner of the tank farm. Based on the data collected to date and the site hydrogeology, the areal extent of methylene chloride in the groundwater is limited to the tributary to Tinkers Creek which is the point of groundwater discharge.

*? What about culvert and deeper flow!*

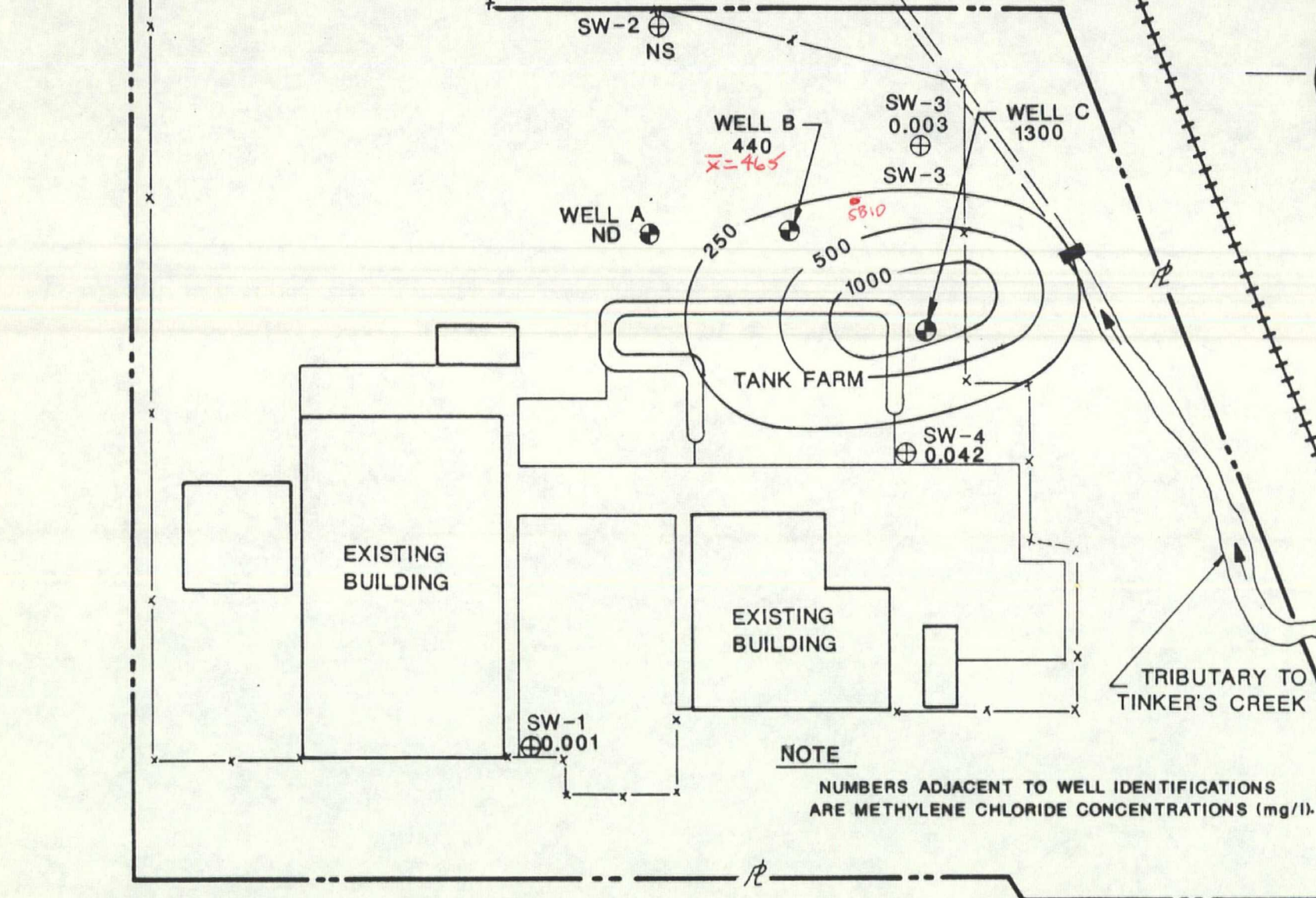
Surface water sampling and analysis in October 1986 did not reveal the presence of methylene chloride in upstream or downstream samples. Surface water sampling by the OEPA in 1985 showed an increase in downstream methylene chloride concentration, however, this was apparently the result of elevated levels of methylene chloride in the outfall.

*Is it not going in creek or aerated?*

The vertical extent of VOCs in the groundwater is limited to the weathered shale. The weathered shale is underlain by highly consolidated gray shale which forms a confining layer.

*Prove it!*





⊕ MONITORING WELL (INSTALLED 1986)

⊕ MONITORING WELL (INSTALLED 1982)

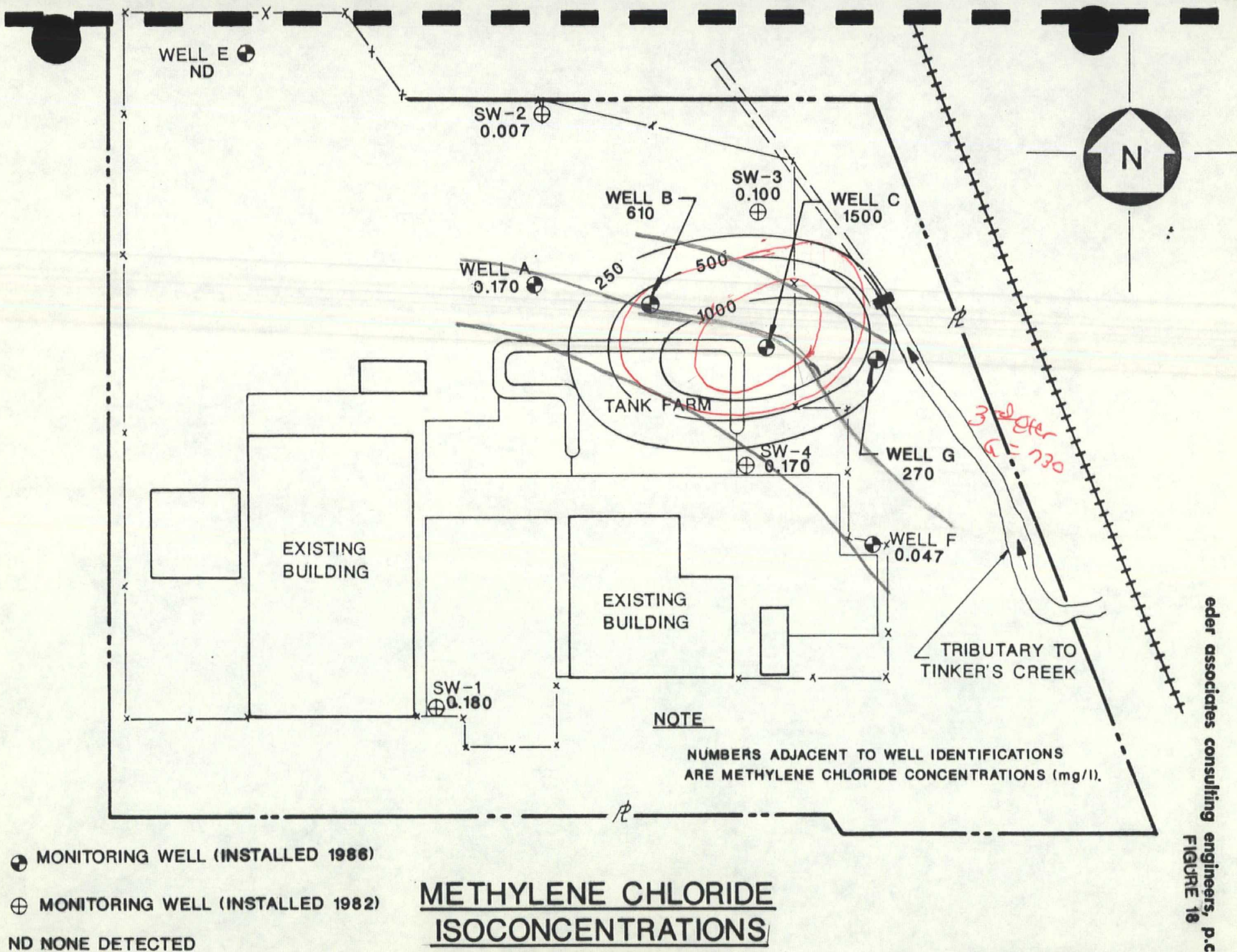
ND NONE DETECTED

NS NOT SAMPLED

# **METHYLENE CHLORIDE ISOCONCENTRATIONS** **MAY 1986**

SCALE 1"=100'







Methylene chloride was not the primary constituent detected in soil samples from the tank farm, however, the data indicates that the release of methylene occurred in the past and that there is probably no continuing source or release.

*How is this concluded?  
M.C. levels increasing.*

February 1987 analysis of Well G samples found acetone although none was detected in previous sampling. Acetone was detected in Well B at 92 mg/l in May 1986, but was not in the Well B duplicate. The anomalous occurrence of acetone in Wells B & G will be confirmed by additional sampling.

Physical conditions in the tank farm could increase the rate of migration of contaminants from the tank farm to groundwater. The two sumps in the tank farm are used to collect precipitation (perched water), which accumulates in the tank farm. These sumps are open at the bottom and top and the annular space between the outside of the sump pipe and the earth is not sealed. Precipitation accumulates in the northeast and southwest corners of the tank farm in the general area where the sumps are located. Moreover, grade is slightly lower in these corners of the tank farm, and these areas are natural collection points for any spills in the tank farm area.

*Are all tanks checked?*

*Sump Speeds? Depth?*

Perched water was encountered in the tank farm, around the cistern and beneath the process building. The tank farm is the apparent source of the perched water around the cistern and beneath the process building and perched water migrates through the fill around underground piping and beneath structures. Static levels of perched water in the tank farm are approximately 1.0 to 2.5 ft. above perched water levels in the cistern and beneath the building indicating the existence of a hydraulic gradient which causes perched water flow from the tank farm to the other areas.

*Also S.S. System*

*mostly Floaters*

## 7.2 Underground Cistern

The areal extent of VOC contamination in the soil around the cistern is shown in Figure 16 in Section 7.1. The vertical extent of



VOCs is shown in the cross section, Figure 15 in Section 6.6. In general VOCs were detected to the depth at which groundwater was encountered. Background VOC levels were approached in soil samples collected from boring SBC-6, SB-34 and SB-35 which generally bound the soil contamination in the area of the cistern.

Perched water with a floating a layer of mineral spirits was observed entering the cistern through and around the inlet pipe. Borings drilled through the floor of the process building identified the presence and general extent of the mineral spirits and perched water that migrates to the cistern along and in the interconnecting piping. The occurrence of perched water under the plant is apparently limited to subsurface areas that are backfilled with permeable material (i.e., sand) particularly around underground piping. Perched water was not encountered in soil borings SB-34 and to the east of the process building.

Analysis of water in the cistern and perched water beneath the plant shows the presence of methylene chloride and various ketones in concentrations which suggest a common origin. Contaminants in perched water under the building and in and around the cistern are reasonably linked to the past operation of the cistern and to the interconnected floor drain system in the plant. These drains are now sealed. Possible additional sources of contamination in the perched water are from standing liquid in the pump room and distillation area where liquid could seep through the concrete floor.

*Migration from tank farm too!*

VOC contaminants were detected in the groundwater sample collected at Well F. The VOCs included methylene chloride (0.47 mg/l), xylene (0.012 mg/l), vinyl chloride (0.024 mg/l) and trans, 1,2-dichloroethylene (0.240 mg/l). The concentration of methylene chloride detected in Well F was less than the background upgradient well. It is reasonable to expect that contamination in the soil and in perched water in and around the cistern would be reflected in the groundwater at Well F by the presence of ketones and methylene chloride. However, these contaminants were not detected in groundwater at Well F.

*Not in GW flow path from cistern.*

*might not detect floaters. Boring Well F has VOC's in surface sand fill overlying till some @ SB46 (Well F). Many floaters*



### 7.3 "Chem-Pack" Fill

The "Chem-Pack" material used to grade the site varies in depth from 1.0 ft. to 9.0 ft. with a maximum depth of 15 ft. in the area of soil boring SB-21.

The primary constituents in the "Chem-Pack" are iron, manganese, chromium, zinc and copper. EP toxicity tests showed low leachability of the metals from the "Chem-Pack" material and barium, which was detected at a low level (0.27 mg/l), was the only EP toxic metal detected in the leachate. Based on the EP toxicity results, the "Chem-Pack" does not exhibit EP toxic characteristics.

Leachate from the "Chem-Pack" material contained high levels of sulfate. However, the "Chem-Pack" is neutralized pickle liquor which would be expected to contain calcium sulfate, a product of lime neutralized pickle liquor.

Metals at concentrations similar to those detected in the "Chem-Pack" were also found in soil approximately three ft. below the "Chem-Pack". However, EP toxicity tests show that these metals are not readily leachable. The occurrence of metals found in the soil at this depth is likely the result of mixing "Chem-Pack" and soil during surface grading operations.

Two anomalous samples were encountered while drilling in the "Chem-Pack" area. The samples appeared to be foundry sand, which may be an artifact from filling and grading and a variant of the "Chem-Pack" material with a higher concentration of chromium and lime. Neither of the anomalous samples were EP toxic.

Samples from Well SW-3, located downgradient of the "Chem-Pack" fill area showed elevated levels of sulfates and chlorides and these parameters were also detected in "Chem-Pack" leachate.



Well SW-3 contained similar EP toxic metals concentrations to background, which shows that EP toxic metals are not leached from the "Chem-Pack" to the soil and groundwater. "Chem-Pack" is apparently a source of copper and iron detected in downgradient groundwater.

The occurrence of elevated levels of sulfates and chlorides in groundwater is limited to the area downgradient of the "Chem-Pack". Iron found in groundwater at Well SW-2 originates in the "Chem-Pack" area and/or at the northwest fill.

#### 7.4 Northwest Fill

The northwest fill is made up of construction debris, foundry sand and slag containing iron, zinc, lead, manganese, copper and nickel. EP toxicity tests on fill samples showed levels of metals at concentrations up to one hundred times less than EP toxic concentrations. No VOC or PAH compounds were detected in the fill at levels above background.

Monitor Well E located downgradient of the northwest fill contained an elevated level of iron probably originating from foundry sand and/or slag.

#### 7.5 Neutralization Pits

The major constituent in samples from both pits was iron. Copper was detected at 657 mg/kg in the west pit and at 203 mg/kg in the east pit. Nickel was detected in both pits at 54 mg/kg and 35 mg/kg. Other metals were detected at concentrations similar to background. EP toxicity tests were not performed on neutralization pit samples.

Monitor well SW-2 is located downgradient of the neutralization pits and "Chem-Pack" and shows elevated levels of iron and copper. The neutralization pits may have in the past or may presently be contributing to the iron and copper detected in downgradient Well SW-2.



The USEPA expressed concern that organic solvents may have been disposed of in the neutralization pits. The plant operating records indicated that isopropyl ether was the only organic product treated in the neutralization pits and it is not a hazardous regulated substance. Isopropyl ether was detected in soil samples out to soil boring SB-43. However, organic analyses of samples collected from the neutralization pits do not show the presence of VOCs other than isopropyl ether at concentrations greater than background and Well SW-2, located downgradient of the neutralization pits, did not show detectable levels of VOCs.

#### 7.6 Container Storage Area

VOCs and metals were detected in the soil around the perimeter of the container storage area in concentrations and at depths which varied from one boring to another indicating that their occurrence is related to surface spills. Moreover, the VOCs are generally limited in vertical extent to the uppermost 10 ft. of soil. *Specifically Upper Fill.*

Low levels of VOCs including methylene chloride, xylene, vinyl chloride and trans, 1,2-dichloroethylene were detected in groundwater at Well F. These VOCs characterize the container storage area and not the contaminants found in and around the cistern. In general, concentrations of metals (lead, chromium, barium and mercury) were found to vary in similar fashion to the VOCs and, even where the VOCs were highest, metals concentrations (except mercury) did not exceed twice background. Mercury was found at 1.5 mg/kg. Groundwater at Well F showed low levels of barium and chromium. *Source!*

#### 7.7 API Tank Basin Area

VOC concentrations in soil boring SB-50 were similar to background levels, and VOCs in SB-51 approached background at a depth of 16.5 ft. Metals in the soil sample from soil boring SB-51 which contained VOCs, showed concentrations less than metals background. Soil contamination with VOCs in the area of the API tank appears limited to the area around soil boring SB-51. *SB 51: 8'9.5' Till surface below fill. High VOC's (Fluorides). SB 18 Contaminated also.*



### 7.8 Storm Water Collection System

Effluent limitations for COD, TOC and BOD have been exceeded at Outfall No. 001. During dry weather there is a low flow discharge from Outfall No. 001 which contains VOCs. These VOCs could cause elevated levels of COD, TOC and BOD. There are no known process piping connections to the storm water collection system.

Effluent limitation exceedances are apparently caused as subsurface perched water containing VOCs migrates to and infiltrates the storm water piping system. This infiltration also explains the low flow discharge which occurs during dry weather. During periods of wet weather, runoff flowing through the piping system decreases VOC concentrations as shown by the inverse proportional relationship of COD and flow rate.

The backfill around piping in areas around the cistern and solvent tank farm provides a conduit for migration of contaminants in perched water. Based on the COD data, there does not appear to be a VOC source to the storm water collection system in the plant areas west of the shipping dock.

*Where sampled?*

EA found no significant increase in the concentration of VOCs in downstream surface water, and any VOCs detected were close to the method detection limits.

Sampling conducted by OEPA also found VOCs in the outfall. Based on the OEPA's results, the discharge from the outfall can be assumed to cause the increase in downstream concentrations of VOCs. As EA's sampling supports no such conclusion, it is impossible to say with confidence that any downstream impacts are related to the HCC discharge, although the outfall is the probable source of elevated methylene chloride in downstream surface water as reported by the state.



At present, HCC collects the water infiltrating the storm water piping during dry weather periods. The water is collected in the 1500 gal. outfall tank and is transferred to the API tank, where it is stored for subsequent off-site disposal at a permitted facility. This operating practice minimizes the volume of perched water entering the creek through the outfall during dry weather periods.

How often pumped?  
where to?  
Contents?  
Managed as H.W.



## 8.0 ENVIRONMENTAL ASSESSMENT

Chemical residues attributable to past facility operations are found in soils, subsurface water and at an outfall to surface waters, however, there is no significant threat to the environment and any health related risks are limited to certain on-site locations and activities.

### 8.1 Contaminant Identification

Laboratory analysis has established the concentration of chemical residues in each media at the HCC site (Section 6.0).

*also  
pore  
H<sub>2</sub>O*

Residues found in soils differed from location to location at the site. Soils in and around the cistern, tank farm and container storage area contain elevated levels of the organic constituents, methylene chloride, acetone, 2-butanone, tetrachloroethylene, toluene, ethyl benzene and total xylenes. Soils in the "Chem-Pack" fill area contain high levels of iron, manganese, copper, chromium and zinc. The northwest fill area also contains elevated levels of iron, manganese, copper, nickel and lead. Areas in and around the neutralization pits show elevated levels of iron and isopropyl ether.

*Assumptions*

Groundwater containing elevated levels of methylene chloride was found downgradient of the tank farm, however, the vertical distribution of this and other organic chemicals in the groundwater is limited to the weathered shale. The areal extent of contaminated groundwater is limited and groundwater discharges to surface water which is of notably poor quality both upstream and downstream of the HCC site.



## 8.2 Exposure Evaluation

### Environmental Fate & Transport

A number of organic chemicals were found in the soil and groundwater at the HCC facility, however, for the purposes of this study it is not necessary to assess the migration and fate of each chemical. Methylene chloride is a useful, probable worst case indicator because it is the most common and mobile contaminant found at the site.

*Correct, but only represents sinkers.  
What about floaters?*

Concentrations of methylene chloride were greater than the other organics found in the groundwater, yet it was found to be generally equivalent to concentrations of organic contaminants found in the vadose soil environment. Organic compounds have a wide affinity for organic and inorganic solids in the soil, and the greater this affinity is for solids, the lower it is for water. Organic compounds with higher solubility in water migrate more readily than compounds which are less water soluble and the octanol/water partition coefficient roughly mimics the adsorptive properties it would have in soil. This is a ratio of the amount that a compound dissolves in octanol divided by the amount that dissolves in water. A high partition coefficient indicates that where a substance dissolves preferentially in octanol, it would be strongly adsorbed onto soil particles and would not be very mobile in the environment. ?

The octanol/water partition coefficients and water solubilities of some common organics found in the soil at HCC are as follows:

<u>Compound</u>	<u>Water Solubility (mg/l)</u>	<u>Octanol/Water Partition Coefficient (dimensionless)</u>
Methylene Chloride	17,000	18
Trichloroethylene	1,100	190
1,1,1-trichloroethane	950	150



The octanol/water partition coefficient for methylene chloride is low and it has a very high solubility in water and a very low affinity for soil. Methylene chloride is very mobile in the subsurface environment, and the fact that higher amounts of methylene chloride are present in the HCC groundwater than in the overlying soils indicates that the majority of it has migrated into the groundwater system.

← Only OEPA data

Methylene chloride was found to exist in higher concentrations in downstream surface water samples than upstream samples. It is reasonable to assume that contaminants in the groundwater (mainly methylene chloride) would migrate to and discharge into the surface water tributary system yet the upstream - downstream difference in methylene chloride is inconclusive.

#### Exposure Routes

Relevant exposure routes at the HCC site are limited to the consumption of contaminated groundwater or surface water, contact with contaminated soils and groundwater and contact with contaminated surface waters.

Vapors?

What about East!  
There are no known domestic, industrial or municipal wells downgradient to the groundwater discharge point and the entire site, including the groundwater discharge which is owned and controlled by HCC. Potable groundwater in the area is obtained from underlying sandstone formations which are separated from the upper groundwater and surface water systems by a thick shale siltstone sequence.

← where!

In accord with USEPA's "Guidelines for Groundwater Classification under the EPA Groundwater Protection Strategy", the limited upper groundwater at the site would be classified as a Class III System, which applies to groundwaters that are not potential sources of drinking water.



The possibility of exposure through groundwater ingestion or dermal absorption is limited to on-site personnel that would have prior knowledge and would wear appropriate protective clothing. Personnel exposure to contaminated soil is limited to the "Chem-Pack" fill area, the neutralization pit area and inside the tank farm. Personnel working in these areas would have prior knowledge and would wear appropriate protective clothing. If excavation work is conducted in soils around the tank farm, "Chem-Pack" fill area, neutralization pits, northwest fill area, container storage area, cistern and API tank areas, contractor's personnel would have prior knowledge and would wear appropriate protective clothing.

Peoples exposure to contaminated soils, groundwater or surface waters is remote. The general public is not allowed on site without reason and supervision. All wells are capped and locked, the facility is surrounded by a fence which is also locked each night. The facility complies with Federal and state regulations governing security at treatment, storage and disposal sites.

### 8.3 Risk and Environmental Toxicity Evaluation

The consumption of groundwater migrating from the HCC vicinity is remote. There are no potable wells downgradient of the plume and all local potable water is supplied by municipal, industrial or private wells which obtain water from aquifers far below and separated from the limited groundwater available at HCC. All monitoring wells at the site are capped and locked. Contact with groundwater is not possible at the site unless permitted by HCC. Personnel engaged in sampling activities have prior knowledge and use of protective clothing. The possibility of future risk is reasonably avoided by placing a notice and restriction on groundwater use and contact in the property deed.

The risk to on-site personnel posed by contaminated soils found on-site is insignificant. HCC personnel regularly work with hazardous substances as part of their daily routine. HCC management requires



that all personnel wear protective clothing (i.e., boots, gloves, etc.) at all times while working on the site. The facility complies with Federal and state regulations governing personnel training for workers at treatment, storage and disposal sites.

Exposure to contaminated surface water is limited to casual contact by an unknowing population and is not likely because there are no nearby residential areas and the stream has no recreational value.

Ecological studies conducted by the OEPA have shown that there are no viable fish communities in the Deerlick Run drainage system which is classified as a "Nuisance Prevention Stream". A September 1986 report submitted by the OEPA, "Toxicity Evaluation Report on Surface Water Discharges, Hukill Chemical Corporation", recommends that this designation continue.

Downstream environmental and public health impacts caused by discharges from the HCC site are insignificant and cannot be measured with confidence. The entire Deerlick Run stream network downgradient of HCC is degraded by chemical discharges which cannot be attributed to HCC activities.

#### 8.4 Contaminants and Applicable Guidelines

The Deerlick Run drainage system is classified as a "Nuisance Prevention Stream" and neither the creek nor the groundwater is a potential drinking water source. Drinking water standards, Maximum Contaminant Levels (MCLs) and Recommended Maximum Contaminant Levels (RMCLs) are not relevant.

Table 67 shows the Water Quality Criteria for organic and inorganic contaminants identified in the creek, groundwater, soil and outfall at HCC. Of the organics detected in the creek by the OEPA and EA, all were detected at levels less than the acute aquatic toxicity criteria. With the exception of 1,1,1-trichlorethane and methylene



HUKILL CHEMICAL CORPORATION  
BEDFORD, OHIO

TABLE 67

WATER QUALITY CRITERIA<sup>(1)</sup>

	Acute Freshwater Aquatic Toxicity ug/l	Chronic Freshwater Aquatic Toxicity (ug/l)	Human Health <sup>(2)</sup> (ug/l)	
<u>Organics</u>				
✓ Methylene Chloride	11,000 (3)	(5)	0.19	OAC 3745-1-07 (ug/l) 9,700
Vinyl Chloride	(4)	(5)	5.25	-
Acetone	(4)	(5)	(6)	550,000
1,1 Dichloroethane	(4)	(5)	(6)	-
Trans-1,2 Dichloroethylene	11,600	(5)	(6)	7,000
2-Butanone	(4)	(5)	(6)	160,000
✓ 1,1,1-Trichloroethane	(4)	(5)	1.03	2,000
Trichloroethylene	45,000	(5)	80.7	1,700
Benzene	5,300	(5)	40.0	1,100
4-Methyl-2 Pentanone	(4)	(5)	(6)	-
2-Hexanone	(4)	(5)	(6)	-
Tetrachloroethylene	5,280	840	8.85	540
Toluene	17,500	(5)	424 mg/l	2,400
Ethyl Benzene	32,000	(5)	3.28 mg/l	1,400
Xylene	(4)	(5)	(6)	-
Isopropyl Ether	(4)	(5)	(6)	-
<u>Inorganics</u>				
Arsenic	440	(5)	17.5 ng/l	360
Barium	(4)	(5)	(6)	-
Cadmium	0.012-0.051, 1.5-6.3(7)			(H.B.) 46-186



Table 67 Continued . . .

Organics	Acute Freshwater Aquatic Toxicity ug/l	Chronic Freshwater Aquatic Toxicity (ug/l)	Human Health(2) (ug/l)	OAC 3745-1-07 (ug/l)
Chromium	2200-9900 (8)	44	(6)	(H.D) 2170-5800
Lead 74-400 (8)	74-400 (8)	(5)	(6)	Hardness dependent
Mercury	0.2, 4.1 (9)	(5)	146 ng/l	2.2
Copper	5.6, 12-43 (7)	(5)	(6)	(H.D) 23-67
Iron	(4)	(5)	(6)	-
Nickel	56-16, 1100-3100 (7)	(5)	100	(H.D) 1580-4770
Manganese	(4)	(5)	(6)	-
Zinc	47, 180-570	(5)	(6)	(H.D) 390-1060
Chloride	(4)	(5)	(6)	-
Fluoride	(4)	(5)	(6)	-
Phosphorus	(4)	(5)	(6)	-
Sulfate	(4)	(5)	(6)	-

NOTES:

1. The values in this table are the Water Quality Criteria Guidelines based on acute and chronic toxicity to freshwater aquatic and established water, the USEPA's "Clean Water Act".
2. This value is based on ingestion of aquatic organisms and excludes the consumption of a compound in drinking water. This value is based on a lifetime cancer risk of 10 EE-6.
3. This concentration applies to total halomethanes.
4. No acute toxicity level for freshwater aquatic life has been established.
5. No chronic toxicity level for freshwater aquatic life has been established.
6. No human health level for consumption of aquatic organisms has been established.
7. First values reported are the 24-hour average. Second range of values are the maximum values at any time and values are dependent on calcium carbonate hardness. The range corresponds to hardness ranging from 50 mg/l to 200 mg/l.
8. Acute toxicity level is dependent on calcium carbonate hardness. Values given correspond to hardness ranging from 50 mg/l to 200 mg/l.
9. The first value is the 24-hour average. The second is the maximum limit at any time.



*Lowington*

chloride detected at 20.5 ug/l and 349 ug/l by the OEPA, all organic concentrations were less than the Water Quality Criteria for human health, based on ingestion of contaminated aquatic organisms. Sampling and analysis by EA in October 1986 did not reveal the presence of either of these organics in the creek at HCC.

#### 8.5 Conclusions

Although facility operations at the HCC site have resulted in the release of contaminants, the potential for direct contact with or consumption of contaminated media is remote and there is no increased risk to an unknowing population or to the environment.



## 9.0 PROJECT OBJECTIVES AND ALTERNATIVE CORRECTIVE ACTIONS

The need for remedial action at the HCC facility is limited to those measures which would minimize the existing low order threat to on-site personnel and to an unknowing population which may contact downstream surface water. Specific project objectives are established in this section based on the results of the site work and the Environmental Assessment. Alternative corrective actions will be presented and discussed in Task 4, "Review of Alternative Corrective Actions" as described in EA's November 1985 engineering report, "Plan for Determining the Extent of Potential Contamination".

### 9.1 Project Objectives

The specific objectives to be achieved at the HCC site are as follows:

1. Minimize the possibility that personnel could be exposed to soils in the areas of the solvent tank farm, underground cistern, Chem-Pack fill, northwest fill, neutralization pits, no free liquid storage area and API tank basin.
2. Prevent consumption and minimize physical exposure to groundwater and perched water at the site.
3. Prevent consumption of surface waters transiting the site.
4. Minimize the generation of perched water in the tank farm.
5. Minimize the migration of contamination from the surface to the perched water and groundwater.
6. Minimize the potential for further releases of waste constituents.



Physical exposures to contaminated soils, perched water and groundwater and the consumption of groundwater are effectively controlled at HCC. The project objective of preventing on-site contact with or consumption of affected media is achieved by current operating practices.

Although HCC cannot control public access at off-site locations, the surface waters are classified by OEPA as "Nuisance Prevention Stream", which has no recreational value and is not a drinking water source.

## 9.2 Alternative Corrective Actions

The project objectives can be achieved through a limited remedial action program with the following outputs:

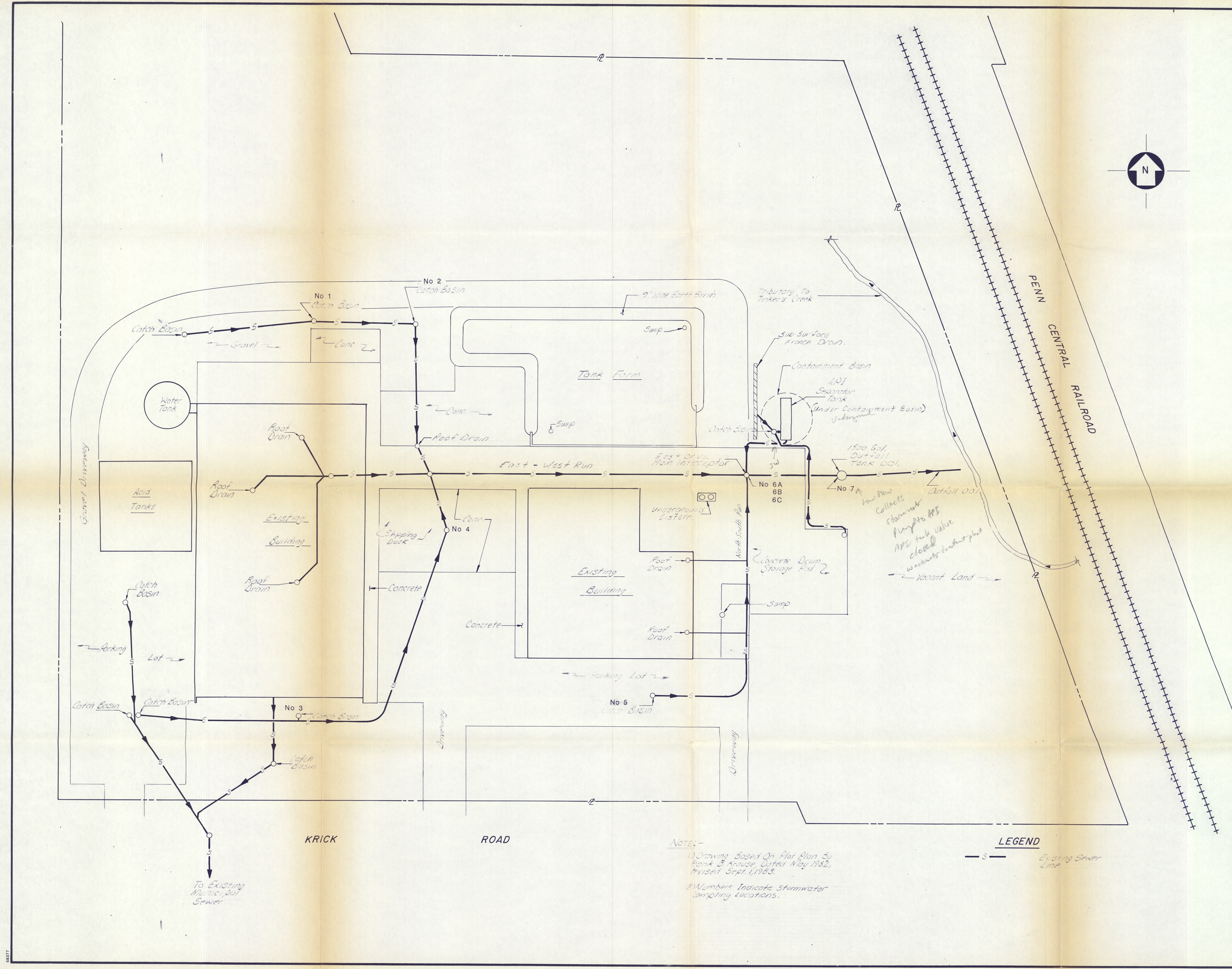
1. Manage groundwater at the site in accord with RCRA alternate concentration limits through groundwater monitoring and institutional control. *264.94(b)*  
*(Objectives 4, 5, 6)*
2. Minimize the migration of residuals from the surface to perched water and from perched water to groundwater. *(Objective 5)*
3. Minimize the discharge of residuals to surface water at Outfall 001. *(Objective 6)*
4. Ensure that adequate notice survives the use of the site by HCC. *(Objectives 1+2)*

*What about surface water and  
GW discharge affects.*



APPENDIX A





№	REVISIONS	DATE	BY
1	General Revisions	3/83	NAA
2	Draft Submittal	4/83	NAA

# STORMWATER SAMPLING

HUKILL CHEMICAL CORP.  
BEDFORD, OHIO

eder associates consulting engineers, p.c.

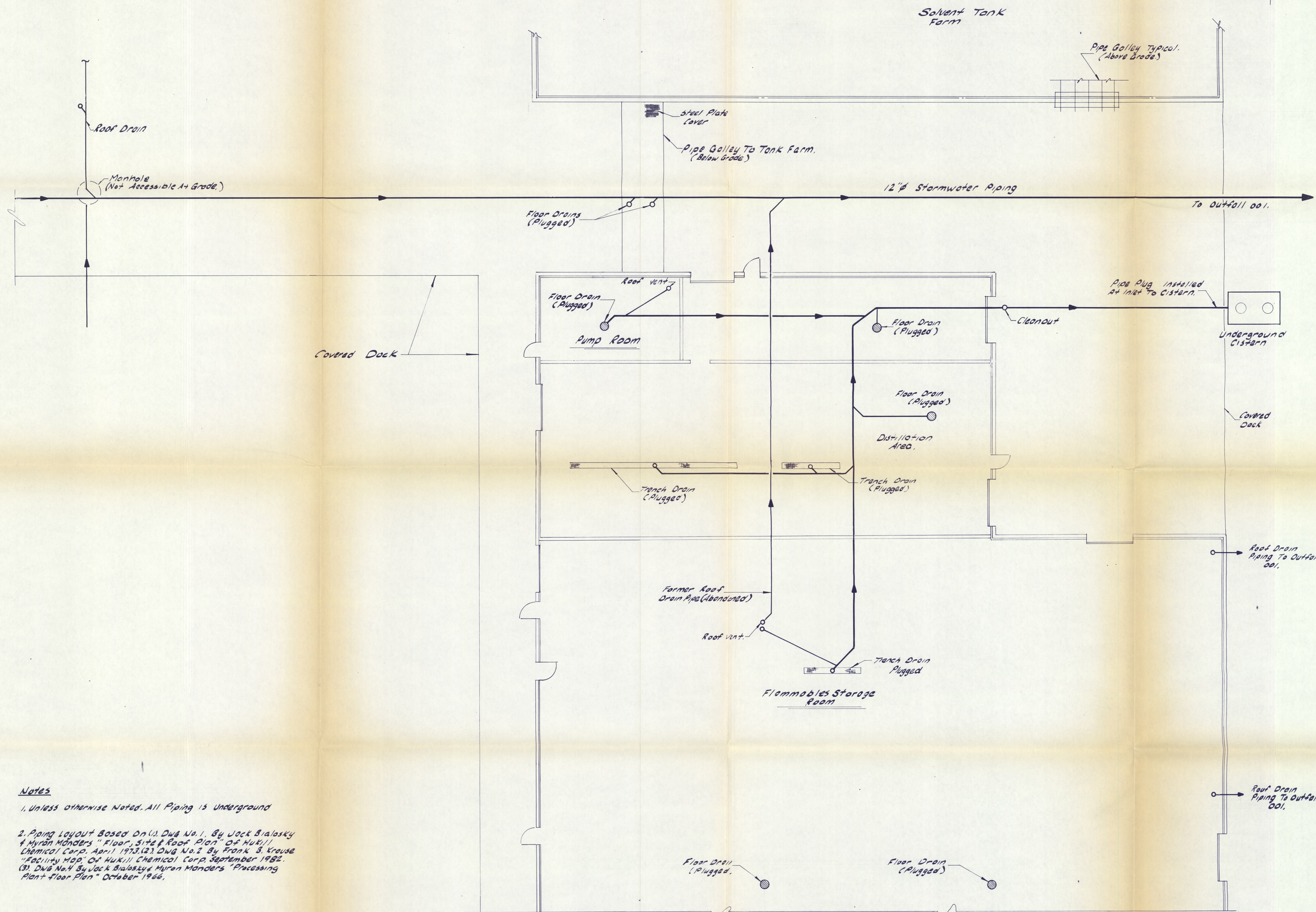
DRAFT COPY

PROJECT STORMWATER SAMPLING HUKILL CHEMICAL CORP. BEDFORD, OHIO	
TITLE STORMWATER DRAINAGE SYSTEM OUTFALL 001	
eder associates consulting engineers, p.c. 85 FOREST AVENUE, LOCUST VALLEY, NEW YORK, 11560	
DRAWN BY FAD	SCALE 1" = 30'
DESIGNED BY NAA	PROJECT № 495-1
APPROVED BY GAB	DWG. № 3
DATE July 1985	

NOTES -  
1) Drawing Based On Plot Plan By  
Frank S. Krouse, Dated May 1982,  
Revised Sept. 1, 1983.  
2) Numbers Indicate Stormwater  
Sampling Locations.

LEGEND  
- S - Existing Sewer Line





Notes  
1. Unless otherwise Noted, All Piping is Underground  
2. Piping Layout Based On (1) Dwg No. 1, By Jack Bialosky & Myron Manders "Floor, Site & Roof Plan" Of Hukill Chemical Corp. April 1973, (2) Dwg No. 2 By Frank S. Krouse "Facility Map" Of Hukill Chemical Corp. September 1982, (3) Dwg No. 4 By Jack Bialosky & Myron Manders "Processing Plant Floor Plan" October 1966.

№	REVISIONS	DATE	BY
0	Draft Submittal	4/87	NAA

HUKILL CHEMICAL CORP.  
BEDFORD, OHIO  
eder associates consulting engineers, p.c.

PROJECT HUKILL CHEMICAL CORP. BEDFORD, OHIO	
TITLE PARTIAL PLAN PROCESS BUILDING DRAIN PIPING	
eder associates consulting engineers, p.c. 85 FOREST AVENUE, LOCUST VALLEY, NEW YORK, 11560	
DRAWN BY JLP	SCALE 1/8" = 1'-0"
DESIGNED BY NAA	PROJECT № 495-1
APPROVED BY GAR	DWG. № 2
DATE February 1987	



APPENDIX B



[illegible]



[illegible]



[illegible]



[illegible]



[illegible]



[illegible]



DATE STARTED: 5-2-86  
 DATE FINISHED: 5-2-86  
 CLIENT: HUKILL CHEMICAL CORPORATION  
 PROJECT NAME AND LOCATION: SITE INVESTIGATION FOR POTENTIAL CONTAMINATION  
 PROJECT NO. (S): 49501  
 DRILLING CONTRACTOR: TRIGGS GEOTECHNICAL  
 BORING FOREMAN: JOHN DINGLEDINE  
 ENGINEER: DICK ANDRIANAS  
 INSPECTOR: DICK RECCHIA  
 SHEET OF 1  
 BORING NO. SB 9

EQUIPMENT: CASINO SOIL SAMPLER CORE AUGER OBS. WELL (OW) DRILLING RIG AND METHOD  
 TYPE: — SPLIT SPOON (SS) UNDISTURBED (US) BARREL — HSA — — CME 55  
 SIZE: — 2" OD — — 6" — — Mobile Drill  
 HAMMER WT/FALL: — 140/30 — — BIT.

SURFACE ELEVATION: NORTH COORDINATE: EAST COORDINATE:  
 SURFACE CONDITIONS: LEVEL DRY GRASS

GROUNDWATER AT 20 FT. AFTER EOB HRS. FT. AFTER HRS.

DEPTH BELOW GND.	CASINO BLOWS PER FT.	TYPE B NO.	DEPTH FROM - TO	BLOWS/6" OR CORE TIME	STRATA DEPTH/ ELEV.	DESCRIPTION AND REMARKS Trace = 0-10% Little = 10-20% Some = 20-35% And = 35-50%	Monitor Well Construction
0	SS 75	75	0-1.5	4 5 7 7	1.5	BRN SILT+SAND some f/gravel, fill material	GRAVEL
	SS 76	76	1.5-3	9 11 6 7		BRN/YW CLAY little silt tr. sand + gravel	
5	SS 77	77	3-4.5	12		BRN CLAY some silt tr f/sand + gravel, fill material	FILL
					8.5		
10	SS 78	78	7.5-9	14 33		BRN/RD CLAY little silt tr. sand + gravel	TILL
	SS 79	79	12-13.5	37 65 130	13		
15						FRACTURED/WEATHERED GRY SHALE	SHALE
	SS 80	80	16.5-17	80/.5		SAME	
20			20-20.5	80/.5	20 ▼	EOB @ 20.5	

TYPE A BORING — CASINO — TO — FT THEN — CASINO — TO — FT.  
 QUANTITIES: 13 L.F. SOIL 7.5 L.F. ROCK 6 SS SAMPLES — US TUBES — L.F. OW PIPE



DATE STARTED: 5-10-86  
 DATE FINISHED: 5-10-86  
 CLIENT: HOKILL CHEMICAL CORPORATION  
 PROJECT NAME AND LOCATION: SITE INVESTIGATION FOR POTENTIAL CONTAMINATION  
 PROJECT NO. (S): 495 01  
 DRILLING CONTRACTOR: TRIGGS GEOTECHNICAL  
 SOILS ENGINEER: NICK ANDRIANAS  
 BORING FOREMAN: JOHN DINGLEEDINE  
 INSPECTOR: NICK RECCHIA  
 SHEET OF 1  
 BORING NO. SB 10

EQUIPMENT: CASING SOIL SAMPLER CORE AUGER OBS. WELL (OW) DRILLING RIG AND METHOD  
 TYPE: — SPLIT SPOON (SS) UNDISTURBED (US) BARREL BIT. PIPE CAP  
 SIZE: — CARBON STEEL — — — — CME 55  
 HAMMER WT/FALL: — 2" OD — — — — Mobile Drill  
 140/30 — — — —

SURFACE ELEVATION: NORTH COORDINATE: EAST COORDINATE:

SURFACE CONDITIONS: DRY, LEVEL

GROUNDWATER AT 24.5 FT. AFTER EOB HRS. FT. AFTER HRS.

DEPTH BELOW GND.	CASING BLOWS PER FT.	TYPE & NO.	DEPTH FROM - TO	BLOWS / 6" OR CORE TIME	STRATA DEPTH / ELEV.	DESCRIPTION AND REMARKS Trace = 0-10% Little = 10-20% Some = 20-35% And = 35-50%	Monitor Well Construction
0	SS 81	81	0-1.5	4 3	3	Kempack Rd/BRN oxidized	Kempack FILL
				2 3			
	SS 82	82	1.5-3	4 4		GRN/GRY Kempack	
5	SS 83	83	3-4.5	4 8		BRN/GRY SAND + SILT	FILL
				7 3		Silt MAT. CINDERS	
				3 4		SAME	
	SS 84	84	4.5-6	2 2		BRN CLAY + SAND some	
	SS 85	85	6-7.5	3 1		FILL MAT. CINDERS etc.	
10	SS 86	86	7.5-9	1 1	16	WOOD	
				1 2			
	SS 87	87	9-10.5	3 5		SAME	
	SS 88	88	10.5-12	6 9			
15	SS 89	89	15-16	25 70		SAME	
20	SS 90	90	19-20	33 80	24.5	FRACURED/WEATHERED GRY SHALE	SHALE
						SAME	
25	SS 91	91	23-24	64 130	24.5	EOB @ 24.5	

TYPE A BORING — CASING — TO — FT THEN — CASING — TO — FT.  
 QUANTITIES: 16 L.F. SOIL 8.5 L.F. ROCK 11 SS SAMPLES — US TUBES — L.F. OW PIPE







[illegible]







DATE STARTED: 4-24-86		eder associates		1 SHEET OF 1	
DATE FINISHED: 4-24-86		BORING REPORT		BORING NO. SB 19A	
CLIENT: HUKILL CHEMICAL CORPORATION					
PROJECT NAME AND LOCATION: SITE INVESTIGATION FOR POTENTIAL CONTAMINATION					
PROJECT NO. 131- 495 01					
DRILLING CONTRACTOR: TRIGGS GEOTECHNICAL			BORING FOREMAN: JOHN DINGLELINE		
ENGINEER: WICK ANDRIANAS			INSPECTOR: WICK RECCHIA		
EQUIPMENT:		SOIL SAMPLER		CORE	
CASING		SPLIT SPOON (SS) UNDISTURBED (US)		AUGER	
TYPE:		CARBON STEEL		HSA	
SIZE:		2" OD		6	
HAMMER WT/ FALL		140 / 30		BIT.	
SURFACE ELEVATION:		NORTH COORDINATE:		EAST COORDINATE:	
SURFACE CONDITIONS: DRY, LEVEL, GRASS					
GROUNDWATER AT 19.5 FT. AFTER EOB HRS. 10 FT. AFTER 18 HRS.					
DEPTH BELOW GND.		CASING BLOWS PER FT.		Monitor Well Construction	
TYPE & NO.		DEPTH FROM - TO		BLOWS / 6" OR CORE TIME	
37		0-1.5		2 4	
38		1.5-3		6 5	
39		3-4.5		7 10	
40		7.5-9		5 8	
41		12-13		11	
42		16-16.5		12 9	
43		19.5-20		20 20	
44				45 100	
45				100 / 1.5	
46				70 / 1.5	
47					
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DATE STARTED: 4/29/86		<b>eder associates</b>		1 SHEET OF 1	
DATE FINISHED: 4/29/86		<b>BORING REPORT</b>		BORING NO. 58 15	
CLIENT: HUKILL CHEMICAL CORP					
PROJECT NAME AND LOCATION: POTENTIAL CONTAMINATION INVESTIGATION BEDFORD OHIO					
PROJECT NO. (S): 995-1					
DRILLING CONTRACTOR: TRIGGS GEOTECHNICAL			BORING FOREMAN: JOHN DINGLE DINE		
ENGINEER: NICK ANDRIANAS			INSPECTOR: NICK RECCHIA		
EQUIPMENT:	CASING	SOIL SAMPLER		CORE	AUGER
		SPLIT SPOON (SS)	UNDISTURBED (US)	BARREL	
TYPE:	—	Steel	—	—	HSA
SIZE:	—	2" OD	—	—	6"
HAMMER WT/FALL	—	140/30"	—	BIT.	
SURFACE ELEVATION:		NORTH COORDINATE:		EAST COORDINATE:	

SURFACE CONDITIONS: LEVEL DRY GRASS

GROUNDWATER AT 22.5 FT. AFTER 2 HRS. FT. AFTER HRS.

DEPTH BELOW GND.	CASING BLOWS PER FT.	TYPE & NO.	DEPTH FROM - TO	BLOWS/6" OR CORE TIME	STRATA DEPTH/ ELEV.	DESCRIPTION AND REMARKS Trace = 0-10% Little = 10-20% Some = 20-35% And = 35-50%	Monitor Well Construction
0		SS16	0-1.5	2 3		Topsoil 4"	FILL ↓
				6 7		BRN f/SANDY SILT little	
		SS17	1.5-3	8 11		clay tr organics	
				6 9		SAME	
5		SS18	3-4.5	12			TILL ↓
		SS19	7.5-9	7 8		BRN SILT + CLAY tr f/c sand	
10							
		SS20	12-12.5	67/1.5		Highly weathered GRY SHALE (dry)	← WATER SEEP 20'-21'
15		SS21	15.5-16.5	110/1.5		SAME	
		SS22	19-19.5	180/1.5		Wet seam 20'	
20							
		SS23	22.5-23	230/1.5		SAME slightly weathered more fractured.	
25		SS24	26-26.5	200/1.5		SAME (dry)	
30		SS25	29.5-30	200/1.4		SAME (dry)	
		SS26	33-33.3	200/1.3		SAME (dry)	
35							
		SS27	36-36.8	200/1.2		SAME (dry)	
40		SS28	39.5-39.7	200/1.2		EOB @ 40'	

TYPE: A	BORING	CASING	TO	FT THEN	CASING	TO	FT.
QUANTITIES:	40	L.F. SOIL	0	L.F. ROCK	13	SS SAMPLES	— US TUBES — L.F. OW PIPE



DATE STARTED: 4/25/86  
 DATE FINISHED: 4/25/86  
 CLIENT: HUKILL CHEM CORP.  
 PROJECT NAME AND LOCATION: POTENTIAL CONTAMINATION INVESTIGATION; BEDFORD, OHIO  
 PROJECT NO. (S): 495-1  
 BORING CONTRACTOR: TRIGGS GEOTECHNICAL  
 ENGINEER: NICK ANDRIANAS  
 BORING FOREMAN: JOHN DINGLELINE  
 INSPECTOR: NICK RECCHIA  
 SHEET OF 1  
 BORING NO. SBCW 16

EQUIPMENT: CASING SOIL SAMPLER CORE AUGER OBS. WELL (OW) DRILLING RIG AND METHOD  
 TYPE: steel SPLIT SPOON (SS) UNDISTURBED (US) BARREL HSA PIPE CAP CME 55  
 SIZE: 2" OD 6" Mobile Drill  
 HAMMER WT/FALL 140/30" BIT.

SURFACE ELEVATION: NORTH COORDINATE: EAST COORDINATE:

SURFACE CONDITIONS: LEVEL, DRY, GRASS

GROUNDWATER AT DRY FT. AFTER 24 HRS. FT. AFTER HRS.

DEPTH BELOW GND.	CASING BLOWS PER FT.	TYPE & NO.	DEPTH FROM - TO	BLOWS / 6" OR CORE TIME	STRATA DEPTH/ ELEV.	DESCRIPTION AND REMARKS Trace = 0-10% Little = 10-20% Some = 20-35% And = 35-50%	Monitor Well Construction
0		SS44	0-1.5	2 4		3" Topsoil SAND & SILT little clay, brick show	FILL
		SS45	1.5-3	9 14 6 4		Blk SAND, little silt cinder show	
5		SS46	3-4.5	7 5a25% S135% C140%		BRP/YW SILT some clay tr. s/sand + gravel	TILL
		SS47	7.5-9	20 24 5a5% S45% C150%		SAME (TILL)	
10		SS48	12-13	37 65		Highly weathered GRy SHALE	
15		SS49	16-16.5	170/1.5		SAME (highly fractured)	
20		SS50	19-19.5	270/1.5		SAME (moist seam 6")	← WET SEEP
			20.5-21	260/1.5		WET SEAM	
25	AUGER					DRY SHALE slightly fractured	
						EOB @ 25'	

TYPE A BORING — CASING — TO — FT THEN — CASING — TO — FT.  
 QUANTITIES: 25 L.F. SOIL 0 L.F. ROCK 7 SS SAMPLES 0 US TUBES L.F. OW PIPE 0



DATE STARTED: 5-6-86		eder associates BORING REPORT		1 SHEET OF 1					
DATE FINISHED: 5-6-86				BORING NO. SB 17					
CLIENT: HUKILL CHEMICAL CORPORATION									
PROJECT NAME AND LOCATION SITE INVESTIGATION FOR POTENTIAL CONTAMINATION									
PROJECT NO. (S): 49501									
DRILLING CONTRACTOR: TRIGGS GEOTECHNICAL			BORING FOREMAN: JOHN DINGLEADINE						
JOBS ENGINEER: NICK ANDRIANAS			INSPECTOR: NICK RECCHIA						
EQUIPMENT:	CASING	SOIL SAMPLER		CORE BARREL	AUGER	OBS. WELL (OW)	PIPE	CAP	DRILLING RIG AND METHOD
TYPE:	—	SPLIT SPOON (SS)	UNDISTURBED (US)	—	HSA	—	—	—	CME 55
SIZE:	—	2" OD	—	—	6	—	—	—	Mobile Drill
HAMMER WT/FALL	—	140/30	—	BIT.					
SURFACE ELEVATION:		NORTH COORDINATE:		EAST COORDINATE:					
SURFACE CONDITIONS: GRAVEL, slight grade towards east, DRY									
GROUNDWATER AT 17 FT. AFTER 1 1/2 HRS.						FT. AFTER HRS.			
DEPTH BELOW GND.	CASING BLOWS PER FT.	TYPE & NO.	DEPTH FROM - TO	BLOWS / 6" OR CORE TIME	STRATA DEPTH/ELEV.	DESCRIPTION AND REMARKS Trace = 0-10% Little = 10-20% Some = 20-35% And = 35-50%			Monitor Well Construction
0	SS	107	0-1.5	4 Sa 20% 4 Si 45% 3 3	Cl 35%	BRN SAND some silt little clay			FILL
	SS	108	1.5-3	4 Sa 40% 7 Si 30% 5 8	Cl 30%	RD/BRN CLAY little silt tr f/gravel			TILL
5	SS	109	3-4.5	11 Sa 30% 5 Si 35% -	Cl 35%	SAME			
	SS	110	7.5-10	5 @ 10 9 Si 40% 15 24	Cl 45%	SAME			
15	SS	111	12-13.5	18 Sa 60% 30 Si 35% 50	Cl 50%	FRACTURED/WEATHERED GRAY SHALE			SHALE
	SS	112	16.5-17	140/.5		SAME			
20	SS	113	20-21	70 300	20 ▼	WET SEAM			
25			25-25.5	140/.5	---	DRY FRACTURED GRAY SHALE WEAK & FISSILE			
						EOB @ 25			
TYPE A BORING — CASING — TO — FT THEN — CASING — TO — FT.									
QUANTITIES: 13 L.F. SOIL 12 L.F. ROCK 7 SS SAMPLES — US TUBES — L.F. OW PIPE									



DATE STARTED: 5-6-86  
 DATE FINISHED: 5-6-86  
 CLIENT: HUKILL CHEMICAL CORPORATION  
 PROJECT NAME AND LOCATION: SITE INVESTIGATION FOR POTENTIAL CONTAMINATION

eder associates  
BORING REPORT

1 SHEET OF 1  
BORING NO. SR 18

PROJECT NO. (S): 995 01  
 DRILLING CONTRACTOR: TRIGGS GEOTECHNICAL  
 SUPERVISOR: WICK ANDRIANAS  
 BORING FOREMAN: JOHN DINGLEDAKE  
 INSPECTOR: WICK RECCHIA

EQUIPMENT:	CASING	SOIL SAMPLER		CORE BARREL	AUGER	OBS. WELL (OW)		DRILLING RIG AND METHOD
		SPLIT SPOON (SS)	UNDISTURBED (US)			PIPE	CAP	
TYPE:	—	CARBON STEEL	—	—	HSA	—	—	CME SS
SIZE:	—	2" OD	—	—	6	—	—	Mobile Drill
HAMMER WT/FALL	—	140/30	—					

SURFACE ELEVATION: NORTH COORDINATE: EAST COORDINATE:  
 SURFACE CONDITIONS: LEVEL, DRY GRAVEL NEXT TO LAKE PUSTAY  
 GROUNDWATER AT FT. AFTER HRS. FT. AFTER HRS.

DEPTH BELOW GND.	CASING BLOWS PER FT.	TYPE & NO.	DEPTH FROM - TO	BLOWS/6" OR CORE TIME	STRATA DEPTH/ELEV.	DESCRIPTION AND REMARKS Trace = 0-10% Little = 10-20% Some = 20-35% And = 35-50%	Monitor Well Construction
0	SS 114	0-1.5	9 13			GRAVEL	FILL
			6 4			GRY SAND + GRAVEL little silt + clay	
	SS 115	1.5-3	4 4		4	RD/BRN CLAY little silt + 4/8 gravel	TILL
5	SS 116	3-4.5	9				
					8	FRACTURED/WEATHERED GRY SHALE	SHALE
10	SS 117	7.5-9	30 18				
			40				
	SS 118	12-13.5	42 85			SAME	
			230				
15	SS 119	16.5-17	240/.5			SAME (moisture)	
					20		
20	SS 120	20-20.5	180/.5			WET SEAM	
	A						
	U T						
	G O						
	E					DRY GRY FRACTURED SHALE	
25	R 28'						
	↓						
						EOB @ 28	
30							

TYPE A BORING — CASING — TO — FT THEN — CASING — TO — FT.  
 QUANTITIES: 8 L.F. SOIL 20 L.F. ROCK 7 SS SAMPLES — US TUBES — L.F. OW PIPE



[illegible]



[illegible]



[illegible]



DATE STARTED: 10-1-86		eder associates		SHEET 1 OF 1	
DATE FINISHED: 10-1-86		BORING REPORT		BORING NO. SB 25	
CLIENT: HUKILL CHEMICAL CORP.					
PROJECT NAME AND LOCATION: Subsurface Investigation phase II Bedford OHIO					
PROJECT NO. (S): 49501					
DRILLING CONTRACTOR: TRIGGS GEOTECHNICAL			BORING FOREMAN: John Dinsledine		
SOILS ENGINEER:			INSPECTOR: NICK RECCHIA		
EQUIPMENT:		SOIL SAMPLER		CORE	
CASING		SPLIT SPOON (SS) UNDISTURBED (US)		AUGER	
TYPE:		STANDARD		OBS. WELL (OW)	
SIZE:		2" OD		PIPE CAP	
HAMMER WT/FALL		140/30		BIT.	
SURFACE ELEVATION: NA		NORTH COORDINATE: —		EAST COORDINATE: —	
SURFACE CONDITIONS: CHEMPACK FILL AREA MUDDY RAIN					
GROUNDWATER AT — FT. AFTER HRS. FT. AFTER HRS.					
DEPTH BELOW GND.		OVA READING		STRATA DEPTH/ELEV.	
TYPE & NO.		DEPTH FROM-TO		DESCRIPTION AND REMARKS	
BLOWS/6" OR CORE TIME		TO		Monitor Well Construction	
0		0-1.5		BRN/GRY SILT SOME CLAY	FILL to 6.5'
		1.5-3		1.5' BLK FOUNDRY SAND	TILL @ 6.5'
5		3-4.5			
	KPI	4.5-6	6.5'	4.5-6 BLK FOUNDRY SAND	
		6-6.5		RD/BRN TILL	
				EOB @ 6.5'	
TYPE — BORING — CASING — TO — FT THEN — CASING — TO — FT. QUANTITIES: 6.5 L.F. SOIL — L.F. ROCK / SS SAMPLES — US TUBES — L.F. OW PIPE					



[illegible]



DATE STARTED: 9-25-86		<b>eder associates</b>		SHEET 1 OF 1	
DATE FINISHED: 9-25-86		<b>BORING REPORT</b>		BORING NO. SB 28	
CLIENT: HUKILL CHEMICAL CORP.					
PROJECT NAME AND LOCATION: SUBSURFACE INVESTIGATION PHASE II BEDFORD OHIO					
PROJECT NO. (S): 49501					
DRILLING CONTRACTOR: TRIGGS GEOTECHNICAL			BORING FOREMAN: JOHN DINGLEDDINE		
SOLS ENGINEER:			INSPECTOR: NICK RECCHIA		

EQUIPMENT:	CASING	SOIL SAMPLER		CORE BARREL	AUGER	OBS. WELL (OW)		DRILLING RIG AND METHOD
		SPLIT SPOON (SS)	UNDISTURBED (US)			PIPE	CAP	
TYPE:	—	STANDARD	—	—	HSA	—	—	CME 55 Mobile Drill
SIZE:	—	2" OD	—	—	4" ID	—	—	
HAMMER WT/ FALL	—	140/30	—	BIT. —				

SURFACE ELEVATION:		NORTH COORDINATE:		EAST COORDINATE:	
SURFACE CONDITIONS:					

GROUNDWATER AT		FT. AFTER		HRS.		FT. AFTER		HRS.		Monitor Well Construction
DEPTH BELOW GND.	OVA READING	TYPE & NO.	DEPTH FROM - TO	BLOWS/6" OR CORE TIME		STRATA DEPTH/ ELEV.	DESCRIPTION AND REMARKS Trace = 0-10% Little = 10-20% Some = 20-35% And = 35-50%			
0	25	SS105	.5-2	3	7		RD/BRN/BLK ASH, BRICK SAND, GLASS, FOUNDRY SLAG + SAND		FILL to 15.5'	
	3.5	SS106	2-3.5	4	3		RD SAND FILL some gravel brick powder			
5					2					
10	1.5	SS107	8-9.5	2	4		SAME			
					1					
15	2	SS108	12.5-14	3	4		SAME ash + cinders		SHALE to EOB	
				6						
20	4	SS109	17-18.5	19	14		RD/BRN HIGHLY WEATHERED SHALE			
				30						
25	-6	SS110	23.5-24.3	60			GRY weathered shale		EOB @ 24.3'	
				100/.3						

TYPE A	BORING —	CASING —	TO —	FT THEN —	CASING —	TO —	FT.
QUANTITIES:	15.5 L.F. SOIL	8.8 L.F. ROCK	6	SS SAMPLES	—	US TUBES	— L.F. OW PIPE







[illegible]



[illegible]



DATE STARTED:						9-25-86						eder associates BORING REPORT						SHEET 1 OF 1					
DATE FINISHED:						9-25-86												BORING NO. SB 32					
CLIENT: HUKILL CHEMICAL CORP																							
PROJECT NAME AND LOCATION SUBSURFACE INVESTIGATION PHASE II Bedford OHIO																							
PROJECT NO. (S): 49501																							
DRILLING CONTRACTOR: TRIGGS GEOTECHNICAL												BORING FOREMAN: JOHN DINGLEWINE											
ENGINEER:												INSPECTOR: NICK RECCHIA											
EQUIPMENT:		CASING	SOIL SAMPLER		CORE BARREL	AUGER	OBS. WELL (OW)		PIPE		CAP	DRILLING RIG AND METHOD											
TYPE:			SPLIT SPOON (SS)	UNDISTURBED (US)		HSA						CME 55											
SIZE:						4" ID						Mobile Drill											
HAMMER WT/FALL			140/30			BIT.																	
SURFACE ELEVATION: M						NORTH COORDINATE:						EAST COORDINATE:											
SURFACE CONDITIONS: NW FILL AREA																							
GROUNDWATER AT						FT. AFTER		HRS.		FT. AFTER		HRS.											
DEPTH BELOW GND.		OVA READING	Type & No.	Depth From-To	Blows / 6" or Core Time	Strata Depth/Elev.	Description and Remarks Trace = 0-10% Little = 10-20% Some = 20-35% And = 35-50%							Monitor Well Construction									
0	0	SS90	.5-2		4		BLK SAND, BRICK, GLASS Foundry slag							FILL to 25.5'									
	0	SS91	2-3.5		7																		
					2																		
5	1	SS92	3.5-5		2		Foundry sand/slag																
														Shale to EOB									
10	0	SS93	8-9.5		3		SAME																
					1																		
15	0	SS94	12.5-14		2		SAME																
					1																		
20	1	SS95	17-18.5		3		SAME																
					1																		
25	-		23.5-25		13		WET SEEP @ 23.5'																
					13																		
	4	SS96	25.5-26			25.5	Rubble @ 25'																
							GRY weathered shale																
30	-																						
		SS97	30.5-30.8		100/3		GRY shale weathered																
							EOB @ 31'																
Type A		BORING -		CASING -		TO -		FT THEN -		CASING -		TO -		FT.									
QUANTITIES:		25.5 L.F. SOIL		5.5 L.F. ROCK		9 SS SAMPLES		-		US TUBES		-		L.F. OW PIPE									